

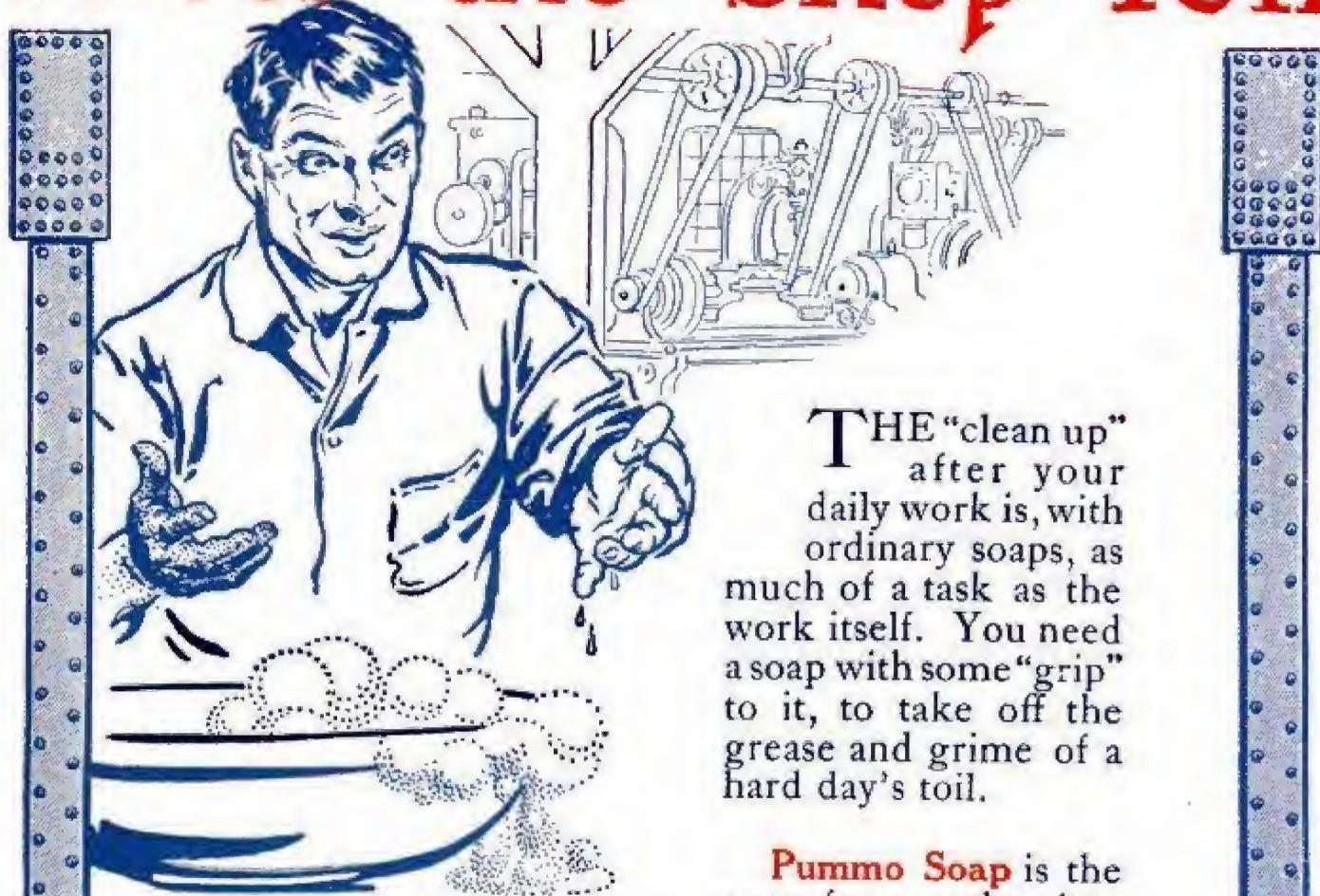
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POPULAR MECHANICS MAGAZINE

H. H. WINDSOR, EDITOR, 225 Washington St., CHICAGO, U. S. A.

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Entered as Second Class Matter Sept. 15, 1893, at the Postoffice at Chicago, Illinois, under Act of March 3d, 1879.

Published monthly by POPULAR MECHANICS CO.

The attention of prospective advertisers is called to the policy of this magazine in accordance with which the publisher waives all claim for payment of any advertisement appearing in any issue where the number of copies actually printed and circulated is less than the number printed on the front cover page.

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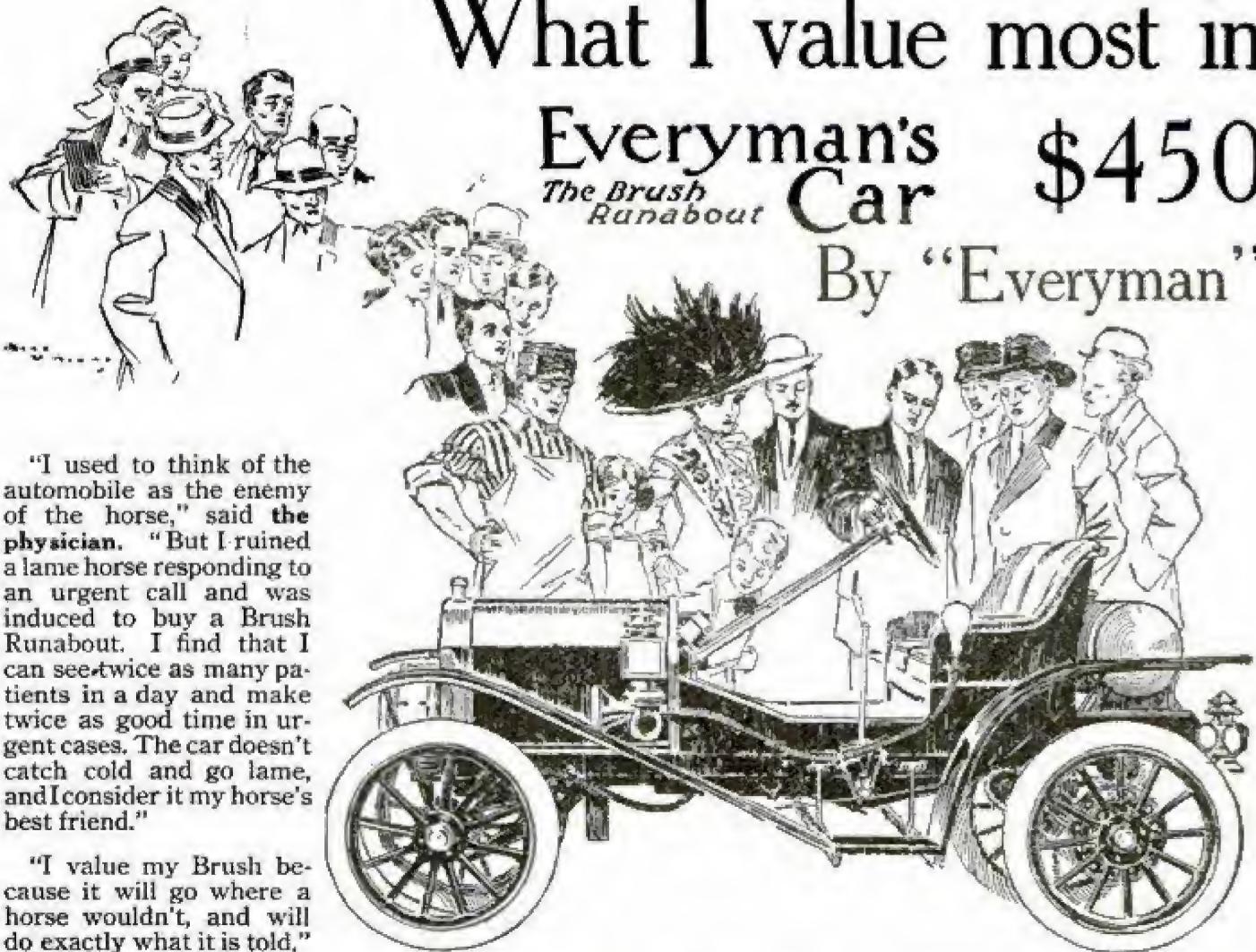
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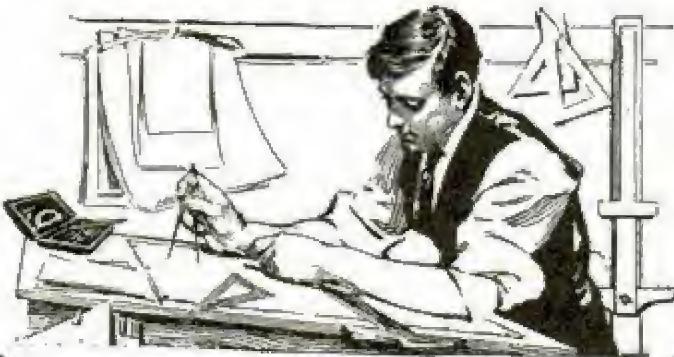
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Checks will be sent on the last day of each month for the prize articles received during that month. Publication in the magazine will follow in about two months.

PRIZES AWARDED FOR JANUARY, 1911

First Prize—F. B. HAYS, St. Louis, Mo..... \$10
"An Air Hoist"
Second Prize—GEORGE NEUFELD, Philadelphia, Pa.... \$5
"Blacksmith's Parallel Tongue"

EXTRA AWARD

On account of there being four contributions this month, each of which deserved second prize, we have made an EXTRA AWARD of four additional second prizes, as follows:

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"Joint for Aeroplane Construction"

C. M. GRAHAM, Oskaloosa, Iowa..... \$5
"Weight on a Belt Shifter"

HAROLD M. ILG, Lowell, Mass..... \$5
"Raising a Countershaft"

C. S. ENRIGHT, Ole Elum, Wash..... \$5
"Filling Container from Gasoline Storage Tank
by Air Pressure"

All accepted contributions to our departments, "SHOP NOTES" and "AMATEUR MECHANICS," are paid for immediately; checks for prize awards are sent at the end of each month.

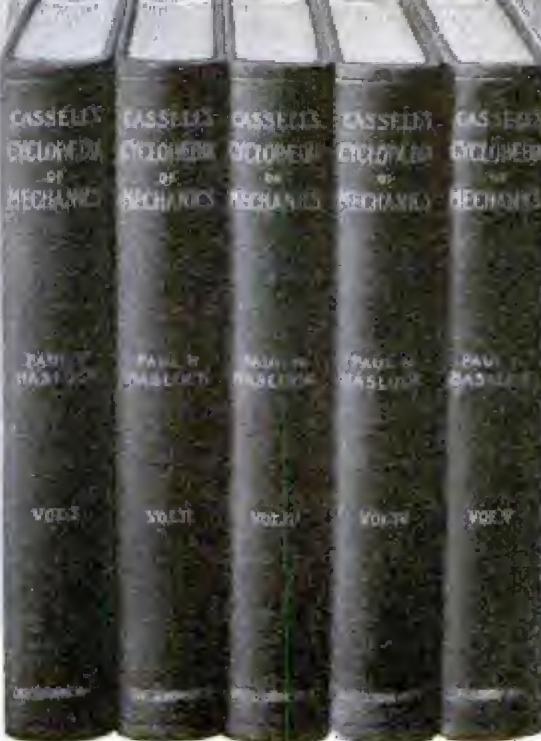
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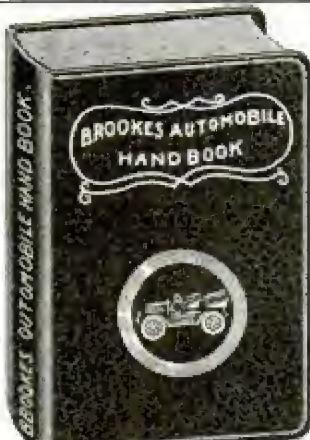
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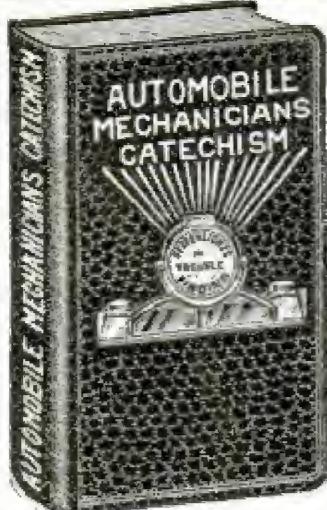
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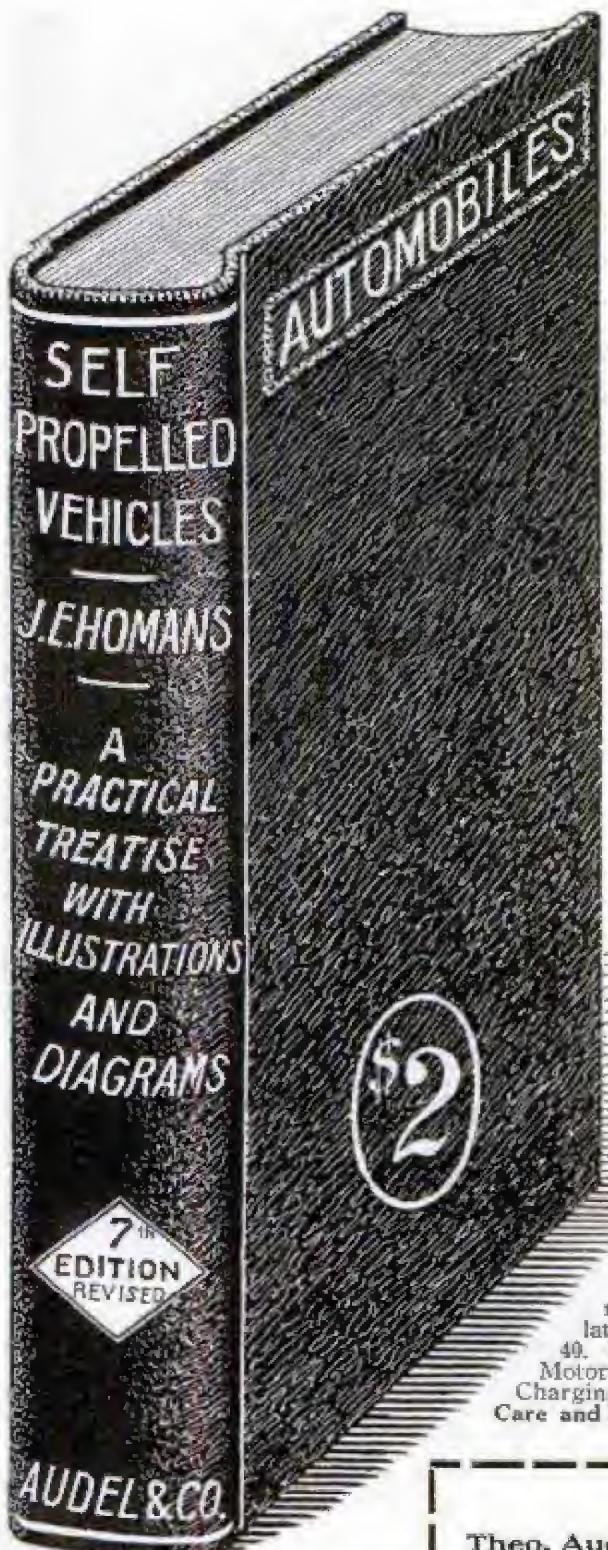
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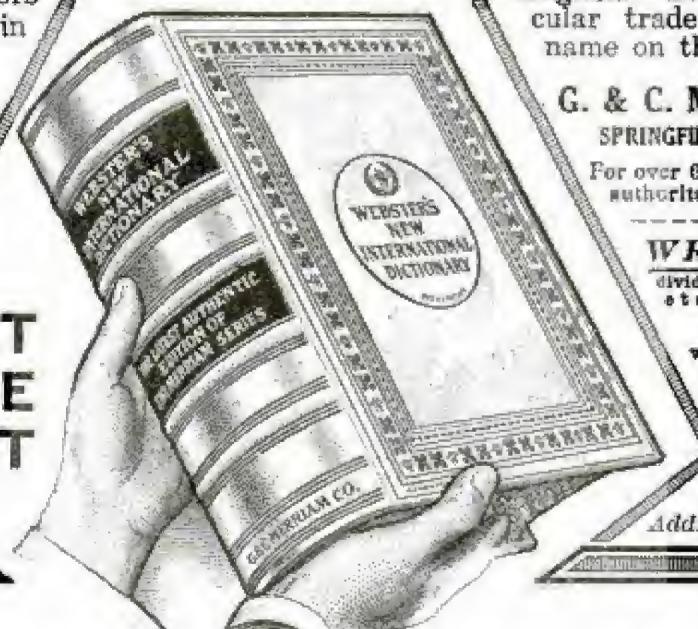
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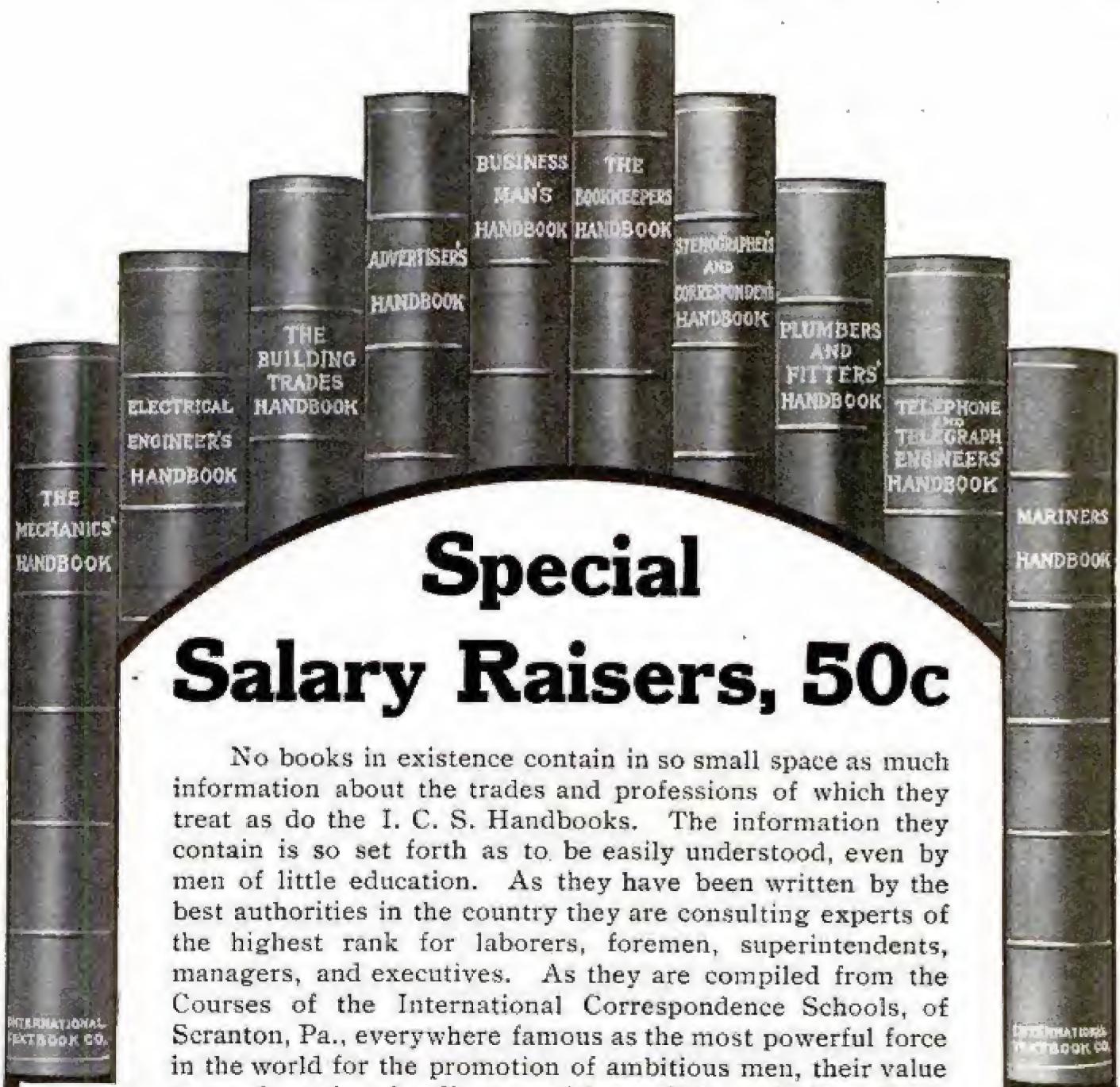
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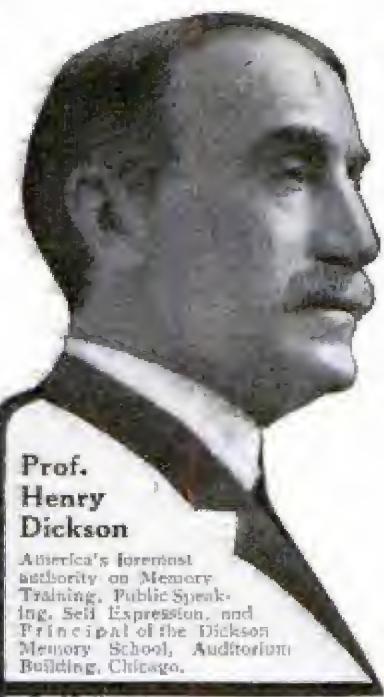
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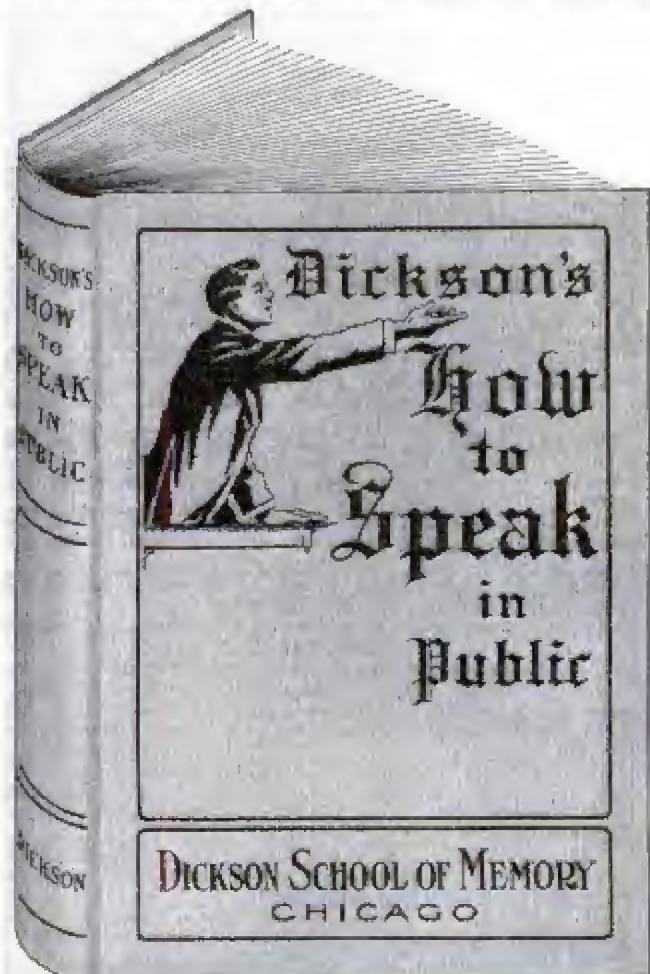
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EARN THIS SUIT in One Hour! Your profit for an hour or two as the representative of our great tailoring house pays for a special made-to-measure suit for you—the handsomest, the most stylish and the most durable ever made. Just show two or three of your friends the samples of our fine wool suitings, take two or three orders and you have earned the suit. You can't fail to get orders. Our 60 beautiful samples create a sensation wherever shown. No one ever saw such materials at the price before. You take no risk. Everything is shipped on approval, subject to 24 hours' examination. Customers try goods on and must be satisfied with style, fit and quality before paying. We pay express on everything! You can undersell everybody. Get clothes for your friends at less cost than they pay anywhere else and make wholesaler's, jobber's and retail dealer's profits. That means the swellest, cleanest and neatest business in America! A Big Business that more than doubles your earnings. We want you to represent us now. Don't wait until somebody else takes this great business. No experience necessary. We furnish you our portfolio with 60 samples of the latest textures, fabrics and colors, absolutely free. Do you want this swell made-to-order suit and this remarkably easy money-making business that will make you rich? A postal or letter mailed to us at once gives you swell clothes and a big business. Write us now. A postal card will do. Or tell your friends about it. Paragon Tailoring Company, Dept. 11, Chicago, Ill.

AGENTS! Wild with excitement! Do you blame them? Everybody eager to buy our beautiful artistic air brush design show cards. Agents making \$75 per week. Cards printed in colors, size 11x14, 35c varieties. No talking—simply show the show cards to storekeepers—the cards speak for themselves. Big profits, something new. Tide just setting in. The show cards are great, you'll say so, you can't help it. Wake right up, no time to argue. Do it now, send this very minute a letter or postal for free catalog and sample. Popular Show Card Co., Peck A, 1235 Michigan Ave., Chicago.

AGENTS—POSITIVELY GREATEST MONEY making proposition out. Manufacture rapid-selling food products at home on \$5. capital, 100 lbs. material costs \$2.07, wholesales to stores for \$18.75; 800% gross profit. Simplest thing known, all to gain, no chance to lose. Process and full particulars ready to start immediately, postage paid anywhere except California, 25c, coin or 2c stamps. Get busy. Brown's Delicacy Supply, 316 So. Figueroa St., Los Angeles, Cal.

\$777 SPARE TIME \$777 Earn \$10.00 to \$15.00 a week during spare time. You can do it. Start a Mail Order business right from your own home, city, town or rural district. We, as manufacturers, have new easy selling plans for you as our Mail Order Dealer to co-operate with us and keep our factories busy. We carry the stock, seasonable leaders, no canvassing. Small Capital. You pay us out of the business. Large profits. Experience not necessary. Do not work and slave for others, helping them to build fortunes but get wise, make it yourself! We show you how. Write me today for Free Plans, positive proof and sworn statement. J. M. Pease, Pres., J. M. Pease Mfg. Company, Dept. A, Pease Bldg., Buffalo, N. Y.

WANT A SWELL SUIT? Show our samples to three of your friends, take two orders easy and make profit enough to get a swell swimming tailored suit free. No trouble, simply show our new up-to-date samples. Everybody surprised, prices so low, styles so beautiful, orders come easy. We take all the risk and guarantee perfect fit or no sale. We pay the express, \$3 a day. Our new agents are making and wearing the swellest clothes besides; old agents after one season make twice as much. Banner agents have a snap. We want a few more hustling agents, willing to dress swell and make \$5.00 a day and up. No money or experience needed. Write quick before we fill your territory and we will send you free a complete outfit to start at once—beautiful samples, latest styles in colors, everything you need to take orders, all fully explained. We will make you even one beautiful suit at a special Inside wholesale price as a sample. It's a wonderful opportunity, so write at once or tell some friend who would be happy to get this grand easy money-making chance. Banner Tailoring Co., Dept. 638, Chicago, Ill.

FELLOWMEN—Positively only perfect Incandescent Lamps and Burners. Burns Kerosene and air instead of money. Burns with or without mantle. Sold under a strict guarantee. Agents wanted everywhere. Exclusive territory. Positively as represented or money refunded. We want reputation. Write at once. American Light Co., Birmingham, Ala.

AGENTS WANTED—Live men to sell the Isograph. The drawing instrument that makes experts of novices. Sells on demonstration. See advertisement on page 111. Send for particulars immediately. Isograph Co., 115 E. 23rd St., New York.

AGENTS—NEW INVENTION. Revolving rubber heels—anyone can put on instantly. Heels never run over—never slip—half the price—three times the wear of any other. Sell for 15c pair; 200% profit. Sell like wild-fire—every one wants them. Lambert Rubber Co., 1274 Washington Blvd., Chicago.

AGENTS WANTED to sell rich looking Imported 3d188 rugs at \$1 each. R. H. Carter, Milan, Tenn., sold 115 in 4 days. His profit, \$31. You can do as well. Write for sample offer and unique selling plan. Exclusive territory. L. Condon, Rug Importer, Stonington, Maine.

WANTED—GENERAL SALES AGENTS wanted in every county to sell personally, appoint local salesmen, to handle our patented bath necessities. Over 260,000 sold in 1910. Quick sales—at extraordinary profits the year round. Our extensive advertising does one-half the work. If your territory is open it means a permanent income to you providing you can qualify. Give full particulars and references first letter. The Progress Company, 195—210 Monroe St., Chicago.

AGENTS for fast selling self-cleaning curry comb and currying scraper. Big money; exclusive territory; \$5.00 per day and up to workers. Berentzen & Homan, 302 North Union St., Chicago.

HIGH GRADE SALESMAN or City Representatives for the most remarkable Instantaneous Calculator ever devised—New Idea—Bound to Revolutionize all present methods. Calculations so marvelous business firms buy instantly and set aside expensive machines. Sells for \$5.00. Multiplication, Division, Fractions, Decimals, Discounts, Percentages, Pay-Rolls, Interest, Inventory, Etc., handled in one-fourth usual time. Fractions easy as whole numbers. Handsome Profits for Capable Salesman. Write for particulars. Instantaneous Calculator Co., Detroit.

BE YOUR OWN BOSS. Start Selling "Modern-Make-Milwaukee" Specialties, 100% profit. We manufacture and advertise. You sell them. Our agents become independent and own their business. Represent us exclusively. Territory going fast. Write for exclusive proposition. "Cat. P." Modern Specialties Mfg. Co., Milwaukee, Wis.

WANTED—One live man in each town to take orders for men's made-to-measure clothes. No money required. Latest styles and lowest prices. You can build up a permanent business and make a splendid salary each day. We pay express, ship subject to examination and guarantee fit. Send your name quick for agency and free samples. Regal Tailoring Co., Dept. 578, Chicago.

AGENTS: Will mail our \$1. UKO Safety Razor with 12 superior blades. Elegant case. Words often mislead. Try it yourself. Send 5c in stamps. Will refund if desired. Splendid proposition. Write at once. The Utility Co., 931 W. 44th St., New York City.

KEENEDGE razor hone; latest discovery; razorblowing impossible; all shavers will buy; 100% profit. Sample 25c. Particulars free. Ideal Mfg. Co., Toledo, Ohio.

AGENTS—Biggest money-maker known. The new Winchester Incandescent Kerosene Lamp revolutionizes old lighting methods. Burns air, not money. Six times brighter than electricity, gas or acetylene at 1-10th cost. Burns with or without mantle. Burner fits any lamp. Saves 75% oil. No trimming wicks. Showing means selling. Territory going fast. Write today. Handsome outfit furnished. Winchester Light Co., Dept. P. M. 3, 26 State St., Chicago.

YOU CAN MAKE \$777 as our general or local agent. Household necessity; rates 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Flitkin, Newark, N. J.

AGENTS: You can positively make \$30 to \$75 a week. New Painted article. Low priced. No competition. Sells in every home. No experience needed. Write for terms. Suction Cleaner Co., 162 Milton St., Dayton, Ohio.

LEARY AND MUNRO SAY: Don't kick about your position. Be our representative. Our agents are making big money, you can do the same. Write 1219 Fillmore St., San Francisco, California.

AGENT WANTED—\$5 to \$25 day selling our automobile specialty; send for free particulars today. Philip O'Donnell Co., Birch St., Stoughton, Mass.

A BUSINESS FOR YOU in your own community. Secure Aladdin Lamp Agency. Produces highest grade modern white light from kerosene (coal oil). No odor, danger, smoke, noise. Simple, clean, durable, reliable, portable. Brighter than electricity. Only successful mantle oil lamp. Guaranteed. Inexperienced men make big money. Ask nearest office for particulars. Mantle Lamp Company of America, Dept. 367, Chicago; Portland, Oreg.; Waterbury, Conn.; Montreal, Winnipeg, Can.

"TOUR UNITED STATES"—"Trip around world." 50 water post cards in attractive boxes. Both sets 25c. Big profits. Secor Company, 502 West 122 Street, New York.

(CELLULOSIA)—Door plates, new, lettering pure gold. Send for sample case. Nothing invested. 100 per cent profit, sell to every house. Public demand them. LaFontaine, Inventor and manufacturer. Sherburne, N. Y.

AGENTS—Either sex: Magic Post Cards; mysterious, fascinating; gets the cash; speak quick; free sample and particulars. State managers wanted. K. C. Post Card Co., Holden, Mo.

BOY AND GIRL AGENTS—Sell 24 packages post cards at 10c each and receive a complete camera free. Write today. C. W. Fenster Co., Dept. 13, Windsor, Mo.

AGENTS—Improved specialty for automobile owners; quick seller; big profits; illustrated booklets free; write today. The Chaddock Specialty Co., Box 388, Polo, Ill.

AGENTS—Send for free booklet. Inside information on the agency business. Filled with money making plans. Pointers and experience of thousands of successful agents. Address: J. M. Finch, 1162 3rd St., Dayton, Ohio.

AGENTS—Over 500% profit. Gold sign letters; sell everywhere; sample free. Johnston Co., Quincy, Ill.

THERE'S BIG MONEY in the mail order business. Publish a mail order magazine of your own at a very little cost. For particulars address. Publisher, 247 West 139 St., N. Y. C.

AGENTS—BOTH SEXES—We control a specialty never placed on market before. Not for sale in stores. Particulars free, sample 15c. Letroy Specialty Co., 16 Park Place, Room 52, New York.

AGENTS—Make \$8.00 daily selling our specialties. New Jersey Home Supply Co., Boonton, N. J.

AGENTS—Sell our Accident policy. Pay \$1000, death and \$5. weekly benefit for \$1. yearly. Easy seller. \$163,000 deposited with Pennsylvania Insurance Commissioner. Commercial Registry Co., Newark, N. J.

SELL EAGLE BRAND MENDING TISSUES. Greatest Labor Saving Invention. 500 per cent profit. Three samples for dime. Eagle Rubber Company, 213 East Tenth St., New York.

REPRESENTATIVES—Mail Order Houses wanted handle Hygienic Hosiery. Made Rights and Lefts to fit the feet. Relieve bunions and corns. Write for particulars. Direct Hosiery Co., 11 South St., Boston, Mass.

AGENTS—Portable Fountain Bath Apparatus. Gives plain and electrical baths. Patented 1910. Money maker. Partner wanted to manage plant and mail order business. G. W. Walters, Patentee—Proprietor Electric Bath Co., Findlay, O.

AGENTS—Don't overlook this. Ten new, fast selling household articles. Just added to our present large line, they are winners, big money makers, write for full particulars. Dexter Supply Co., 334 Dearborn St., Chicago.

BOYS—SELL 30 PACKAGES of Tiger Blue, 10c, for a Hamilton Rifle. Send 3c for package and full instructions. American Pharmacal Co., Box 52 Z., Evansville, Ind.

SHAVEZY RAZOR GUARD Makes the Old-Style Razor Safe. Every man a purchaser. Easy sales. Big profits. Sample prepaid 50c. Particulars free. Write today. Shavezy Co., Dept. P, Baynes St., Buffalo, N. Y.

SMALLEST ALARM CLOCK and Bible in world, 10c each. prepaid. W. H. Garner, A. 119 South Lafayette St., Evansville, Ind.

AGENTS earn \$25 to \$50 weekly selling our latest styles beautiful braided waists, and dresses, Mexican drawn work, petticoats, various embroideries. Catalogue free. National Imp. Co., Desk 27, 699 Broadway, N. Y.

WE HAVE THE GOODS that people want. Liberal commissions to agents. Write us today. E. L. Shepard, 308 Racine St., Delavan, Wis.

AGENTS—Stamp names and addresses on key checks, name plates, watchfobs, hotel and baggage checks. We supply blank stock and stamping outfits. Sample free. Hart Manufacturing Co., 80 Guernsey St., Brooklyn, N. Y.

MAKE \$60 TO \$100 weekly selling our small bottling outfit for saloons. New article, easy seller, large demand. Nothing like it. Write now for free information. Simplex Mfg. Co., Dept. Keweenaw, Ill.

"EXTENDED VISION" Delightful \$2.00 book on Heaven. Tells in every home visited by death. Agents sample and instructions, \$1.25. Big profit, quick sales. G. Taber Thompson, D. D., 526 Spruce St., Philadelphia.

FREE GOLD SAMPLE goes with first letter. Something entirely new. Every firm wants it. Orders \$1.00 to \$100.00. Nice pleasant business. Write today. Metalle Mfg. Co., 406 N. Clark, Chicago.

AGENTS, a check protector that fits on the tip of your pen holder. Sells on sight for 35c. Over 100% profit. Sample and prices mailed for 20c. H. Bassett, 5921 Indiana Ave., Chicago.

AGENTS—\$50 to \$75 every week selling our new invention. Every home needs, wants and will buy. Write National Stovepipe Holder Co., 101 Main St., Ottawa, O.

WEAR THIS STYLISH SUIT! The man who is admired is the well-dressed man whose clothes are fashionable, and are 1911 styles. You will be that man in your neighborhood! An all-wool, tailor-made suit of flashy 1911 Broadway clothes awaits the first man in your neighborhood who answers this spring announcement. 1911 styles are just in. You get this Suit—the swellest, classiest, snappiest style we ever created—and better your appearance! This is our idea: We want one man as our representative in your neighborhood. You've got a lot of friends. They wear clothes. It is the easiest thing in the world to get them to order their clothes from you. Prices \$7.50 and up. Those orders mean a big business that more than doubles your salary, and the work is the easiest, cleanest, neatest occupation in the world. New representatives make \$5 to \$10 a day. You simply take the order and measurements and mail them to us. We make the clothes, ship them on approval to your friend and hand you the profit money. A Regular Cine! That's the beauty of being in business for yourself. Sit right down now; write us a postal or a letter for the free outfit to representatives. And you get the swellest suit of fashionable tailor-made, all-wool, 1911 clothes ever worn in your neighborhood. If your personal appearance and a big business is worth a postal or a 2c stamp to you, then act now—write us today. Address American Woolen Mills Co., Dept. 468, Chicago, Ill.

AGENTS—You can make \$10.00 a day selling our new high grade original Air Brush Design Show Cards to storekeepers. 350 varieties. Catalog and sample free. Peoples Show Card Concern, 711 W. Madison St., Chicago, Ill.

WANTED STATE AGENTS must be good in figures, to handle Seerance's Rapid Calculator. D. N. Seerance, Ft. Worth, Tex.

MINIATURE ALARM CLOCKS, TELEPHONES, and bibles; smallest in the world; thousands sold. Each 10c. Dozen 75c. Globe Novelty Co., 17 Leavenworth, Omaha, Neb.

BE A CHEWING GUM MANUFACTURER at your home, no machinery necessary, 500 per cent profit, big demand. Particulars free. Jensen & Schwartz, 1913 Welton St., Denver, Colo.

AN ADDING MACHINE costs \$300. Just think—we will mail a sample of our Lightning Multiplier, with special terms to agents, for 10c. Simplicity Co., 420 Ashton, Grand Rapids, Mich.

WANTED: HUSTLING AGENTS for our household specialties. Crescent Mfg. Co., Erie, Pa.

SELF-THREADING NEEDLES, 10c a paper. Agents wanted; samples and terms free. Ladies' Art Co., Dept. 41, St. Louis, Mo.

WE WANT AN AGENT in every factory. Easy work—Good money. C. T. Johnstone, Dept. O, Rochester, N. Y.

COLODRIAN WATER PEN! Guaranteed to write perfectly with water. Agents wanted. Sample 10c. Chas. Hicks, Waterford, N. Y.

MAKE \$6 A DAY—Exclusive household specialties; samples furnished. Metzner & Co., West Allis, Wis.

\$100 MONTHLY and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Steady work. S. Scheffer, Treas., M. N. 125, Chicago.

\$25 WEEKLY and expenses to men and women to collect names, distribute samples and advertise. Steady work. C. H. Emery, M. H. 25, Chicago, Ill.

BIG MAIL FREE—20c registers your name in our Big Mailing Directory in 100 magazines. Secor, Publisher, 504 West 122 Street, New York.

MONEY for you! See "Books," Lundy & Son.

TELEPHONES—at $\frac{1}{2}$ the usual price. Agents make big money. Telephone Sales Co., Kilbourn, Wis.

BULLY! GREAT! IMMENSE! That's what all our agents say after selling our attractive 1911 Combination packages of soap and toilet articles with valuable premiums, 100% to 300% profit. One Michigan agent made \$65 in 47 hours; another \$21 in 8 hours; another \$22.50 in 10 hours. Act now—not tomorrow. Davis Soap Co., 80 Union Park Court, Chicago.

WANTED LIVE WIRE REPRESENTATIVES for high-grade patented article. Greatest fall and holiday specialty. Also standard seller to barbers, hotels, hairdressers, best homes. Write for special fall offer. Give full particulars first letter, stating territory desired. Saitax Co., 2309 Wabash Ave., Chicago.

BIG MAIL ORDER and Agents specialty. Perfumed "Victoria" Laundry Gloss saves hard rubbing of clothes and prevents the iron from sticking. A boon to agents. A blessing to the housewife. Nickele for 10c sample with terms. Fred. Sander, Malden, Mass.

AGENTS—Ladies or Gents; get on the ground floor; selling our latest and best 25c Pie Crimper, Trimmer and Sealer, ever made; 150 per cent profit; carry dozen in pocket or purse. Circulars free. Stange Mfg. Co., 22 Green St., Yates Center, Kansas.

ACTIVE MEN OR WOMEN to work individually or organize and direct selling crews on patented gas cooking appliance. Saves fifty per cent. Exclusive territory and 100% profit. A. F. Decker, Sales Manager, 37 E. 28th St., N. Y.

AGENTS—Sell Addison wonderful improved gasoline system lamps. No smoke. No smell. No dirt. Simple, instantaneous, big profits. Addison Light Co., 107 W. Michigan St., Chicago.

\$10 PER DAY—Legitimate substitute slot machine; sells like wildfire. \$1.00 sample free, secure territory now. Sidney Game Co., Sidney, N. Y.

AGENTS—\$1.00 hourly. One handed flour sifter. Just patented. Only one in the world. Sample free to workers. Ebsight Mfg. Co., B 507, Columbus, Ohio.

LIVE WIRE SALESMEN, sell our own make brushes for every household use. Write for particulars, territory and the eight advantages of our proposition. 125% profit. Capitol Brush Co., Hartford, Conn.

AGENTS MAKE BIG MONEY—Big pay, no experience, no capital required. 5,000 new art specialties, photo pillow tops 25c, portraits 30c, bromides 25c. New 1911 catalog and samples free. Write Daniel H. Ritter Co., Madison St., Chicago, Ill.

GET OUR AGENTS' PRICES. Business and calling cards, Electric Pocket Flash Lights, Household Specialties. Send 6c postage. Lartz, 1947 Orchard, Chicago.

\$3.00 RAZORS, WITH STRAP, mug, and brush, \$1.20. Agents wanted. Vox Company, Atchison, Kansas.

COLLECT NAMES, information, etc., for business concerns. Steady, profitable home business. Instructive booklet for stamp. Information System, 238, Marietta, Ohio.

SEND YOUR ADDRESS and we will mail catalog of 750 quick-selling, guaranteed goods. Over 3,500 articles shown in our four beautiful catalogs. \$500.00 prize contest this month. A. W. Holmes & Co., 151 Broad St., Providence, R. I.

WE ARE GETTING OUT several new, original money makers for Agents and Cantassers. Postal brings particulars. Falls City Supply Co., Dept. M, Louisville, Ky.

AGENTS WANTED for "Sander" Vacuum Cleaner. Works like a carpet sweeper. Revolving of wheels does the pumping. Powerful. Catalogue free. Fred. Sander, Malden, Mass.

KEROSENE MANTLE LAMPS—America's largest variety; repeat order quality; our burner guaranteed best on the market. Gullford Co., Seville, Ohio.

ESTABLISH BUSINESS, CONTROL TERRITORY! Handsome new electric gas-light line. Kerosene mantle lamps. Automobile head-light burners. All 100 candle power. Sell on sight. Special campaign offers. Your chance. Webster Spec. Mfg. Co., Waterbury, Conn.

AGENTS—Sell the Pinless Clothes Line. A labor-saving invention; sells on sight; write quick; exclusive territory; \$25 to \$75 weekly; freight prepaid; sample 25c. Pinless Clothes Line Co., 558 Lumber Exchange, Portland, Oregon.

BECOME A MANUFACTURER'S AGENT. We manufacture hosiery which outwears 3 of the ordinary kind, replaced free when hole appears. Easy sales; large profits. First reply obtains agency your city. Triplewear Mills, Dept. D, 724 Girard Ave., Philadelphia, Pa.

PATENTS PROMPTLY OBTAINED. My free booklet will help you to fortune. Read pages 11 and 12 before applying for patent. Write today. Dean Swift, Washington, D. C.

FIGS AND FORTUNES—Is a booklet giving facts on Fig growing near San Antonio. Free. Agents wanted. C. B. Watters & Co., San Antonio, Tex.

USEFULTES 3c. Stewart, San Jose, Cal.

OKARA DIAMONDS, AGENTS, EVERYONE—Wanted to wear and sell these famous gems. Big profits. Sample offer and catalogue. Free. Northwestern Jewelry Co., 55 Northwestern Bldg., Chicago.

GERMAN SILVER KEY CHECKS—Steel letters for marking same, key rings, etc.; over 30 styles. Agents wanted. Sample marked with your name and address, and key ring, 15c. Pease, Die Maker, Winchester, N. H.

AGENTS—\$50 weekly; we manufacture the best needle case made; a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" Envelopes do the work; general agents can make over \$100 weekly; send 10c for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Paty Needle Co., 102 Union St., Somerville, Mass.

AGENTS—WE MANUFACTURE GLASS PAPER. Plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10c. S. H. Parrish & Co., 216 S. Clark St., Chicago.

AGENTS—100% profit. Combination monkey-wrench, plumber's pliers, 15 tools combined. Lightning seller. Sample free. Forsee Company, Box 1335, Dayton, Ohio.

ONE MILLION AGENTS WANTED. Fast seller costing 5c, selling 50c. Every firm needs. Orders to \$50. Postal brings samples. Embossed Co., 2487 Milwaukee Ave., Chicago.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

AGENTS—Portraits, 35c; frames, 15c; sheet pictures, 1c; stereoscopes, 25c; views, 1c. 30 days' credit. Samples and Catalog free. Consolidated Portrait, Dept. 1108, 1027 W. Adams St., Chicago.

AGENTS—HANDKERCHIEFS, DRESS GOODS, Carleton made \$8 one afternoon; Mrs. Bosworth made \$25 in 2 days. No experience needed. Free samples. Credit. Freeport Manufacturing Company, 39 Main St., Brooklyn, N. Y.

WIDOWS, Ladies, Men. New. Interesting. Profitable, easy work. Spare time or permanent. Sell our useful specialties. Our original selling plan will double your sales. Particulars and \$2.00 premium offer free. Fair Mfg. Co., HF51, Racine, Wis.

AEROPLANES, DYNAMOS, ELECTRIC FANS. Picture Machines, Mechanical Toys, at half price. Catalogs, \$10 illustrations with your name on. Samples and particulars free. Murphy Company, Norwalk, Conn.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free samples and full particulars. Metallic Sign Letter Co., 406 N. Clark St., Chicago.

MEDALLIONS SELL AT SIGHT. 300 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Resag Co., 1205 W. Randolph St., Chicago.

WANTED—A Man or Woman to act as our Information Reporter, All or spare time. No experience necessary. \$50 to \$300 per month. Nothing to sell. Send stamp for particulars. Sales-Association, 601 Association Bldg., Indianapolis, Ind.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

AGENTS—Sell our Yankee Self-Wringing Mop and make \$4.00 to \$10.00 daily; we also manufacture 500 other fast sellers; particulars free. Scheff Co., 1637 Wells St., Chicago.

AGENTS—\$1.00 hourly. One handed flour sifter. Just patented. Only one in the world. Sample free. Forsee Mfg. Co., B. 1335, Dayton, Ohio.

BIG MONEY MAKERS—Send for illustrated circular of the finest salted peanut vending machine in the country. Simplex Company, Victor Bldg., Washington, D. C.

AGENTS—\$75 monthly. Combination Rolling Pin. Nine articles combined. Lightning seller. Sample free. Forsee Mfg. Co., Box 535, Dayton, Ohio.

PERFECTION POCKET ADDING MACHINE. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. R, Cincinnati, Ohio.

HELP WANTED

WE WANT "I CAN" and "I WILL" men for permanent positions in our regular organization. If you desire to earn more than a mere living, to hold a position of responsibility and to win rapid advancement we will train you during your spare time until you are an expert and qualified to fill the positions we have for real men. We will explain our offer in detail to any one whose letter indicates that he is ambitious to succeed. Address State, Burroughs & Co., (Manufacturers' Representatives), 310 Michigan Ave., Offices 726, Chicago.

\$3,000 to \$10,000 YEARLY in the Real Estate business, without capital; we will teach you the business by mail, appoint you Special Representative in your locality, of leading real estate company, list with you readily salable properties, co-operate with and assist you to permanent success; a thorough commercial law course free to representatives. If you are honest and ambitious, our free 62-page book will surely interest you. Address International Realty Corp., Dept. 1334, Chicago, Ill. (Successor to The Cross Co. and H. W. Cross & Co.)

DON'T YOU WANT TO MAKE Yourself a Real Estate Broker? We will make it easy for you without capital. You can be independent of bosses and have your own office instead of a job—swing big deals and make big commissions instead of working at details on a salary. Write today for booklet "P." No financial backing needed. U. S. Real Estate Institute, 500 Fifth Ave., New York.

CARPENTERS, WOOD-WORKERS, men handy with tools; to manufacture Favorite See-Saws at home. W. B. Thomas, 421 E. 4th St., Chicago, Ill.

WANTED: EXPERIENCED SALESMAN to sell E. M. F. and Flanders Automobiles at first class garage. Carry complete line of supplies. The Glass Block Garage, Norwalk, O.

WANTED—One woman each town having kitchen utensils and store. Make \$10 week. Enclose stamp. Geo. Heinemann, Rogers Park, Ill.

MEN WANTED, age 18-35, for firemen \$100 monthly, and brakemen \$80 on all railroads. Experience unnecessary; no strike. Positions guaranteed competent men. Prountion. Railroad Employing Headquarters—over 400 men sent to positions monthly. State age; send stamp. Railway Association, Dept. 89, 227 Monroe Street, Brooklyn, N. Y.

COLLECT NAMES, information, etc., for business concerns. Steady, profitable home business. Instructive booklet for stamp. Information System, 238, Marietta, Ohio.

WANTED—Wage earners—learn to make best Hand Cleaner on market; at home in spare time; \$15 to \$40 week. G. Monroe, Jamestown, N. Y.

WANTED ONE THOUSAND CHAUFFEURS and repair men. Our demand for automobile engineers exceeds the supply. Calls for men of intelligence and mechanical bent capable of commanding \$100.00 to \$150.00 per month upon graduation. Resident course \$20.00 to \$60.00. Home Correspondence course completed by practical road and shop work at this school, highly successful. Look this up. Auto Schools of America, Dept. T, 1600 Michigan Ave., Chicago.

WANTED—GOOD ABLE-BODIED MEN as Interurban Motor-men, Conductors. \$65 to \$90 per month. New lines under construction. New positions opening up. Experience unnecessary. Enclose stamp for map new traction lines. I. Railway C. I., No. 16, Indianapolis, Ind.

WANTED, AGENTS, MACHINISTS, ATTENTION! Increase salary, new revised Saunders' Hand Book of Practical Mechanics. Best ever ready reference. Thousands in use. Postpaid \$1.00 cloth; \$1.25, \$1.50 leather flap. Big profits. E. H. Saunders, 216 Purchase St., Boston, Mass.

WE START YOU in a permanent business with us and furnish everything. We have new easy selling plans and seasonable leaders in the Mail Order line to keep our factories busy. No canvassing. Small capital. You pay us out of the business. Large profits. Spare time only required. Personal assistance. Write today for plans, positive proof and sworn statements. J. M. Pease Mfg. Co., 1018 Pease Bldg., Buffalo, N. Y.

LIVE MEN IN EACH COMMUNITY to own and operate a business in his home. Profits are \$200 each week. Money comes in every day and all yours. Brand new business. No canvassing. No capital. Particulars free. Frank C. Voorhies, Desk C. B., Omaha, Neb.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

EXPERIENCED OR SUCCESSFUL SALESMEN to sell gasoline lighting systems suitable for any place or purpose; attractive proposition. Write for catalogue. Doud Lighting Co., 210 N. Jefferson St., Chicago, Ill. Dept. A.

PLUMBING, ELECTRICITY, BRICKLAYING or Mechanical Draughting, taught by expert workmen. Short time and small cost. Positions always open. Catalogue free. Write today. Coyne National Trade Schools, 89 E. Illinois St., Chicago.

I WILL START YOU in the Mirror Business. Best paying trade of today. Famous French method. \$5 to \$12 daily. Let me prove it. Free particulars. Corey, Dept. 30, Omaha, Neb.

WANTED

WILL PAY CASH for second-hand 20 H. P. Gas engine. Must be in good running order. A. B. Ferguson, 327 Fifth St., Metropolis, Ill.

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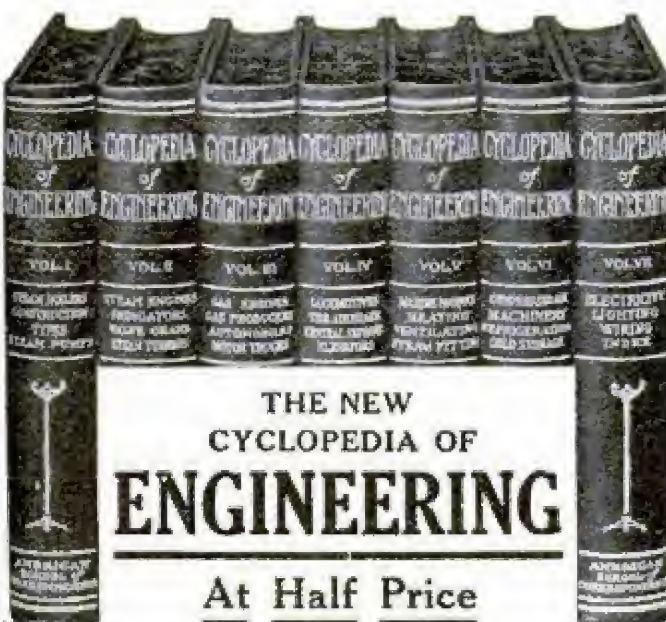
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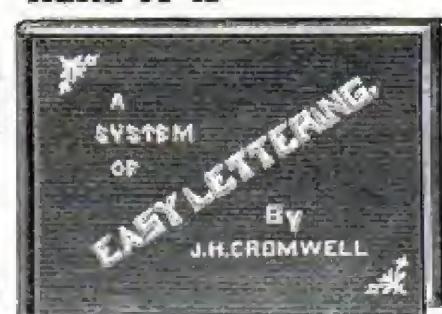
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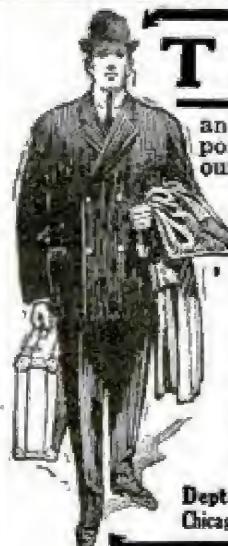


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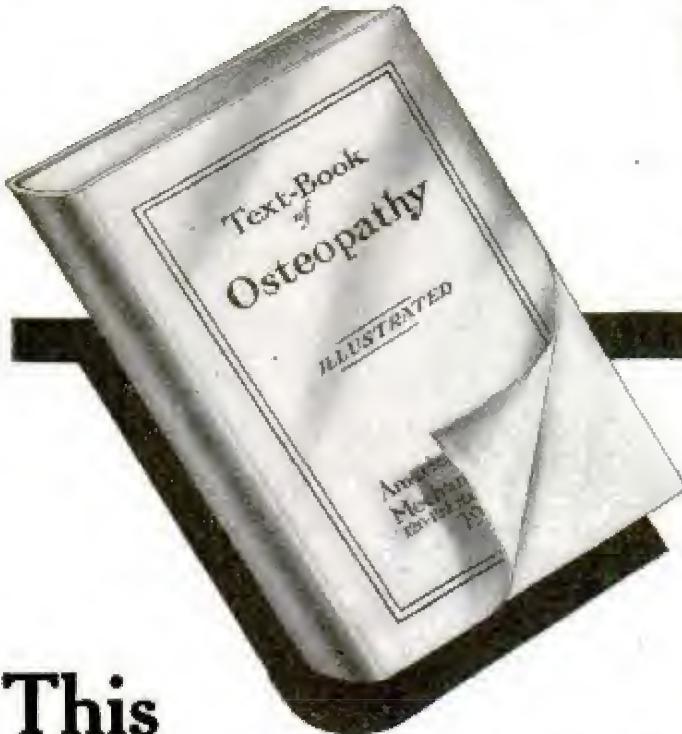
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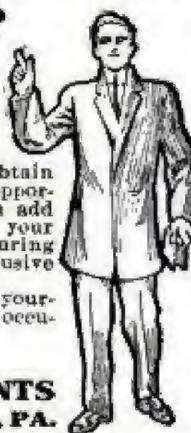
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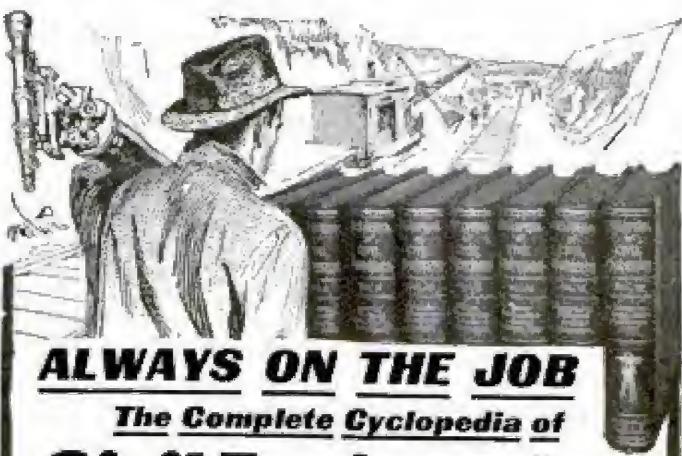
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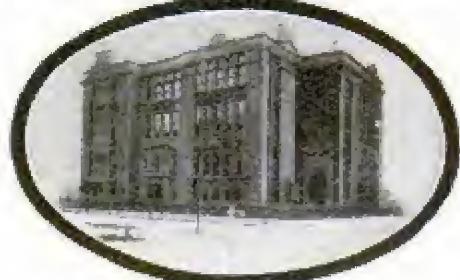
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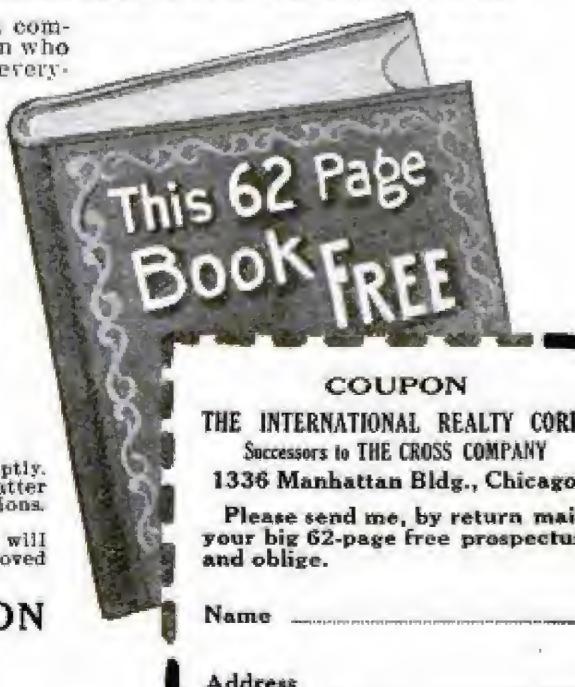
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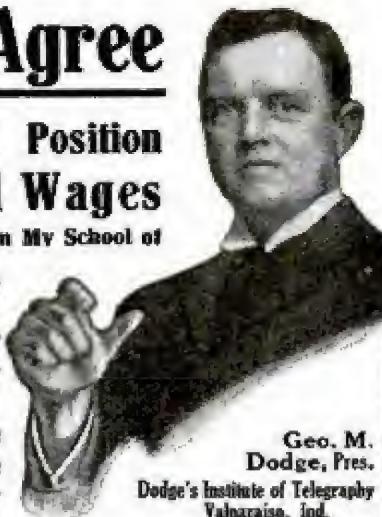
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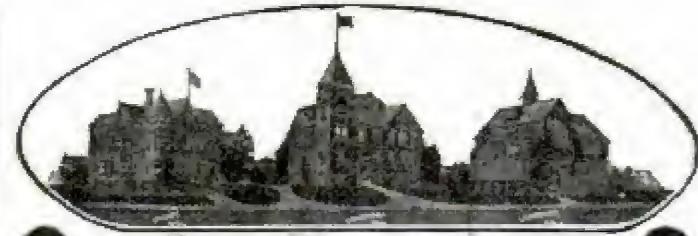
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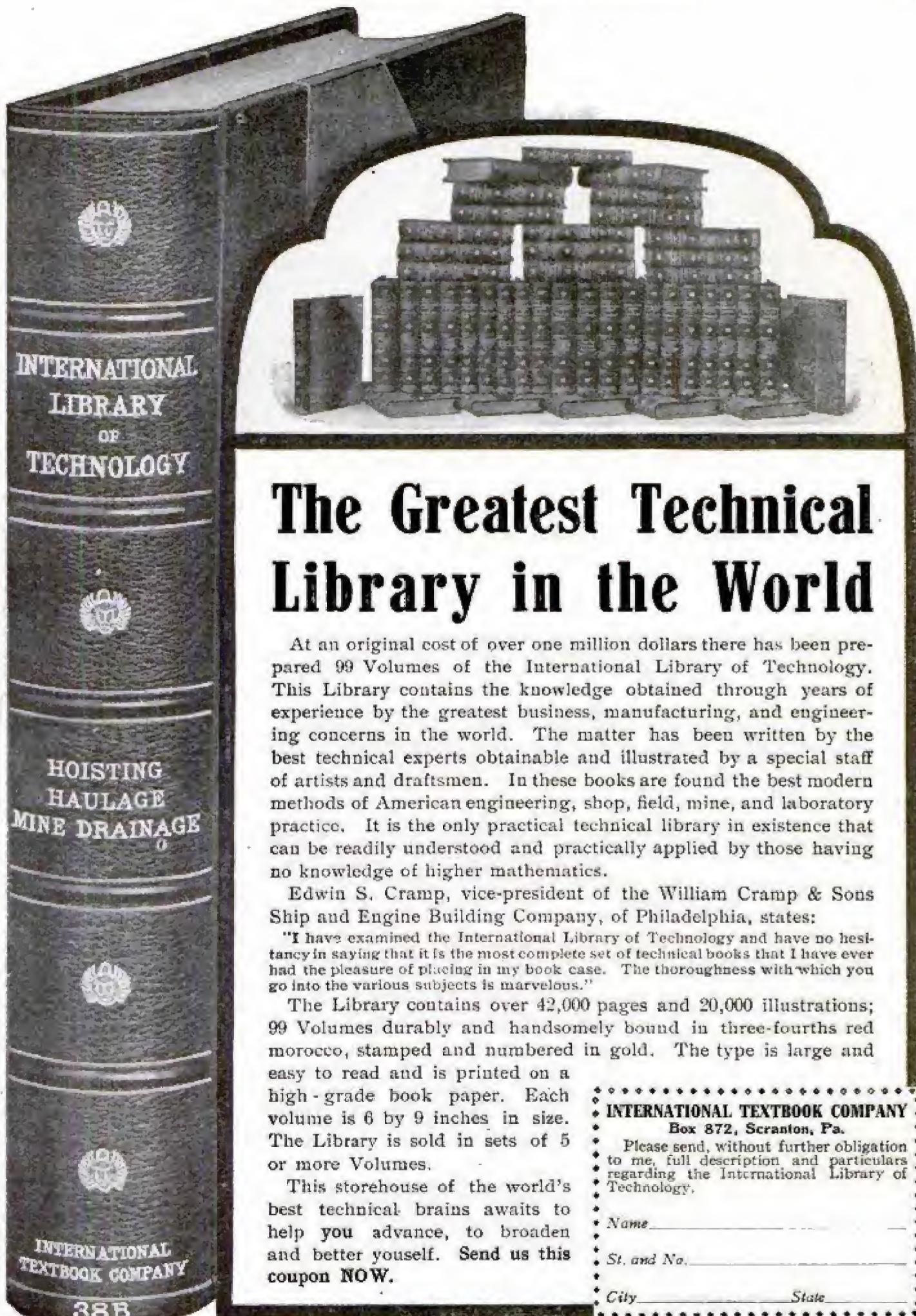
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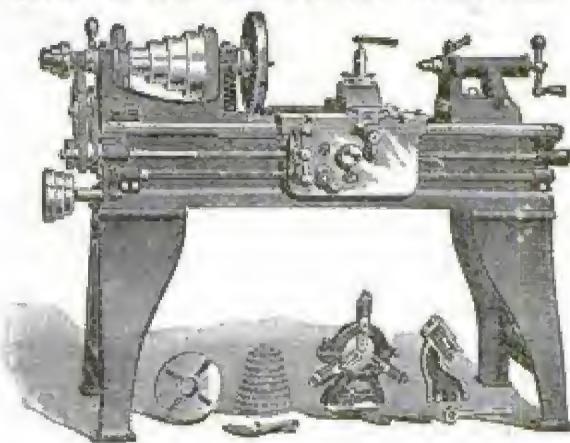
FEW people realize that fire is the most remarkable and valuable discovery ever made by man. Prior to this, man was brother to the brute, but with the coming of fire, came all the wonderful development that has enabled man to assert and defend his claim as lord of creation. We are only in the infancy of high temperature development, yet read of the harnessing of intense heat to the wheels of progress; the contrivances whereby we are able to emulate the volcano in our laboratories so far as heat is concerned and weld steel rails in the street where they lie; the discovery of uses of rare metals in industrial lines by aid of heat. Investigation of the realm of low temperatures also discloses some wonderful facts. All these, and many other phases of this interesting subject are treated as shown by the following list of chapters:

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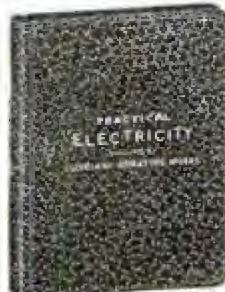
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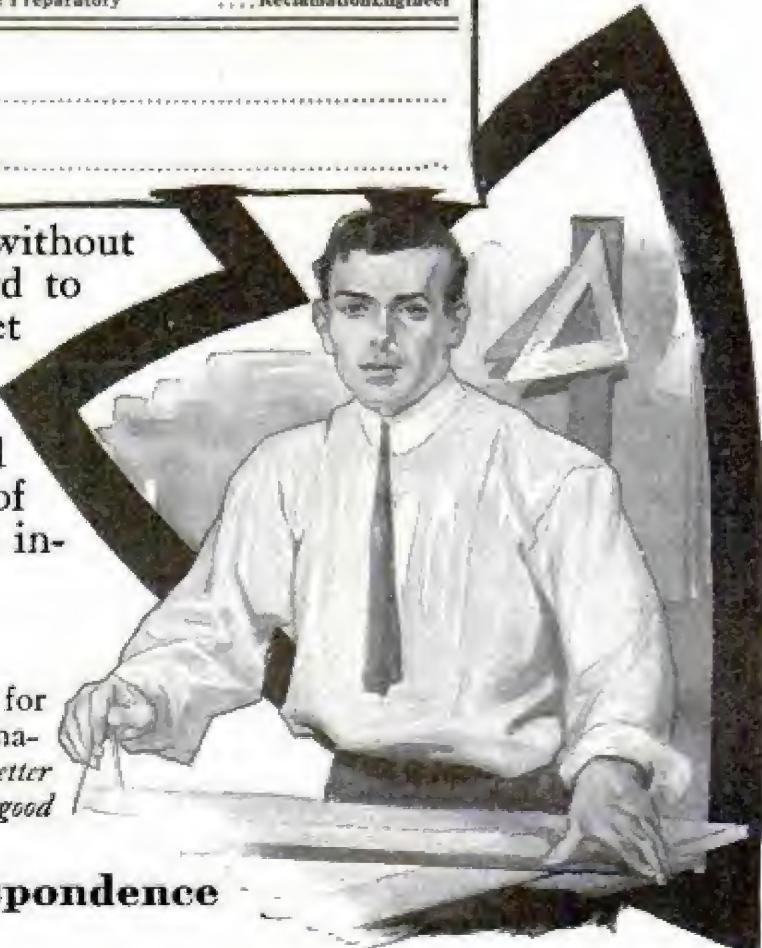
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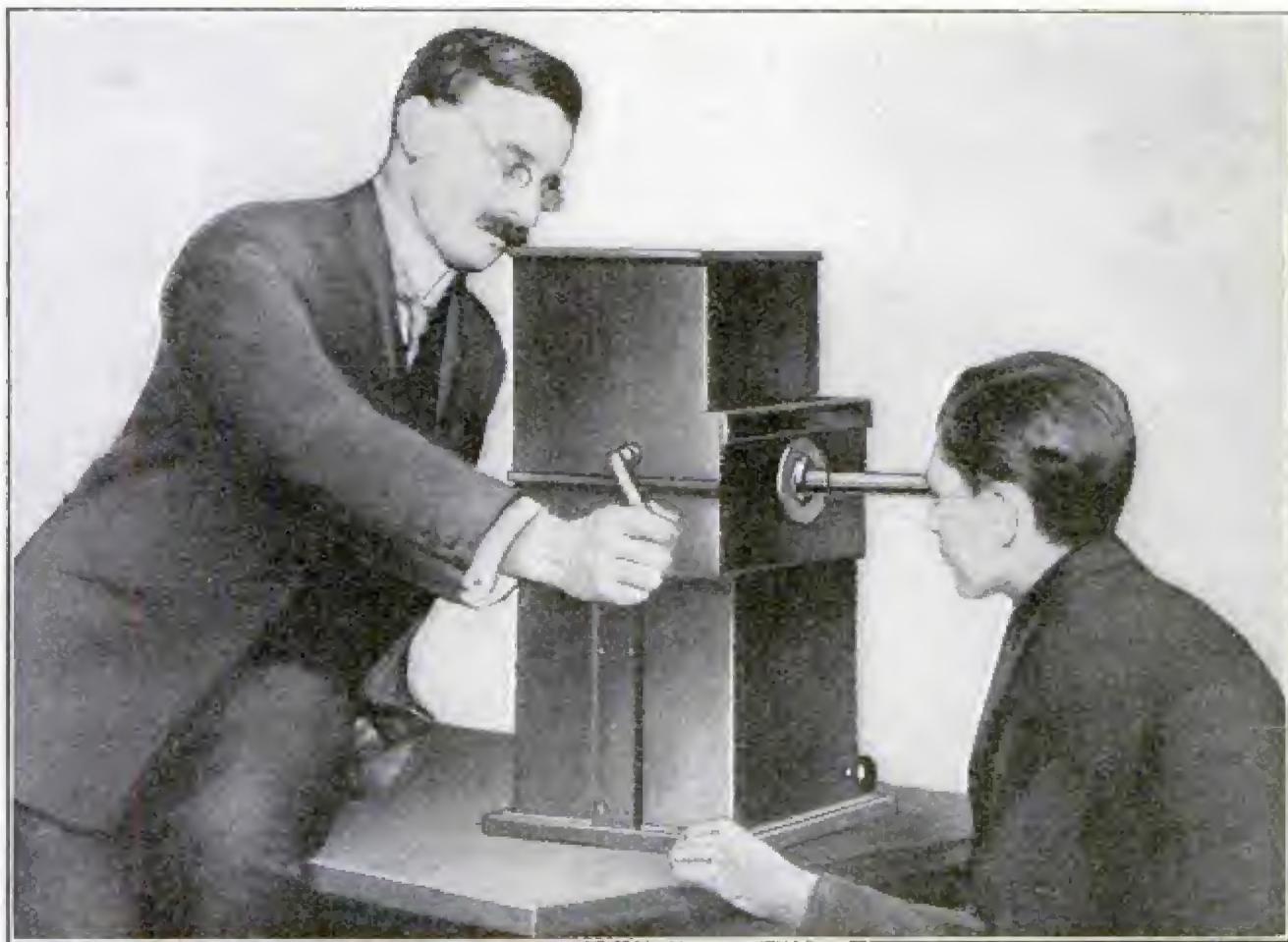
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 15

MARCH, 1911

No. 3

MACHINE ENABLES SCIENTIST TO READ CHARACTER



English Scientist Determining Character of Youth with "Perseveration" Machine

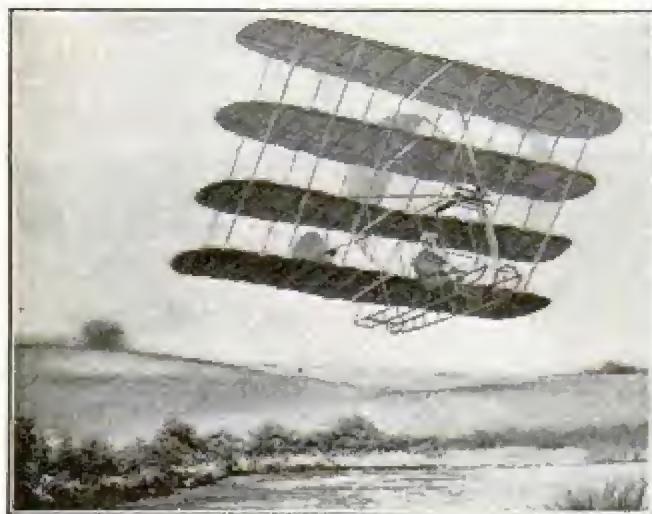
NOW that machines have been made to tell whether or not a person is lying, the world will not be startled by the announcement that an English scientist has perfected an apparatus with which he proposes to read character. His machine is an appliance to test people for what he terms "perseveration." This quality, in its varying degrees, exercises a powerful influence on character and is said to be relatively low in brilliant persons and high in pro-

found thinkers. Maniacs have small, and melancholics a high degree of "perseveration."

The mechanism determines the grade of each patient by presenting colors to the eye intermittently until the observer ceases to distinguish what he calls a "flicker" in the subject. Then he stops the machine, counts the number of crank revolutions on his color-showing apparatus and deduces the "perseveration."

QUADRUPLANE MAKES MANY SHORT FLIGHTS

Several hundred short flights, none of which have been more than a mile



Kentucky Quadruplane in Flight

in length, have been made with this curious quadruplane among the mountains of Carter County, Kentucky. The inventor is M. B. Sellers, who has been experimenting with this type of machine several years.

The four supporting planes are placed one above the other in step formation, the upper plane being in advance. It is claimed to be one of the largest aeroplanes in the world and the total weight, including the operator, is only 250 lb. The first model, complete with engine, propeller, etc., only weighed 78 lb., but the weight of the later models has been increased. The planes have a spread of 20 ft., and the total sustaining surface is 250 sq. ft. The speed attained in the short flights, with a 5-hp. 2-cylinder French motor, direct-connected to the propeller, has been about 26 miles an hour.

SOLIDIFIED GASOLINE FOR AUTOMOBILES

A chemist of Birmingham, Eng., according to reports sent by the United States consul in that city, has invented a means of converting gasoline into a stiff, white jelly, in which condition it can be used as fuel for automobiles.

The conversion is effected by adding 1 3/4 per cent of soapstone and alcohol.

The inventor claims an economy of 30 per cent for the jelly as compared to gasoline in its natural state, also that more solidified gasoline than liquid gasoline can be carried in the same space. A block or cube of solidified gasoline, when being vaporized either in a hot pipe or in the ordinary way, does not cause liquefaction of the mass, the heat simply causing a slow formation of vapor which is consumed in the engine.

NEW INSULATING BRICKS FLOAT

A new insulating lining brick, designed for use where absolute freedom from dampness is necessary, is so waterproofed and burned that 45 per cent of the volume is confined air. Its specific gravity is only 0.90, although its ultimate strength in compression is claimed to be 750 lb. per square inch. The bricks float in water and are claimed to be moistureproof.

AN ELECTRIC MOUSE TRAP

A mouse trap that electrocutes its victims has recently been invented for use in houses where electricity is used for lighting. The trap is simply a box in which two copper plates are set. The bait is put behind the forward plate and the current turned on. When the



New Mouse Trap That Electrocutes Its Captives

mouse attempts to reach the bait, it has to stand on both plates and is instantly killed.

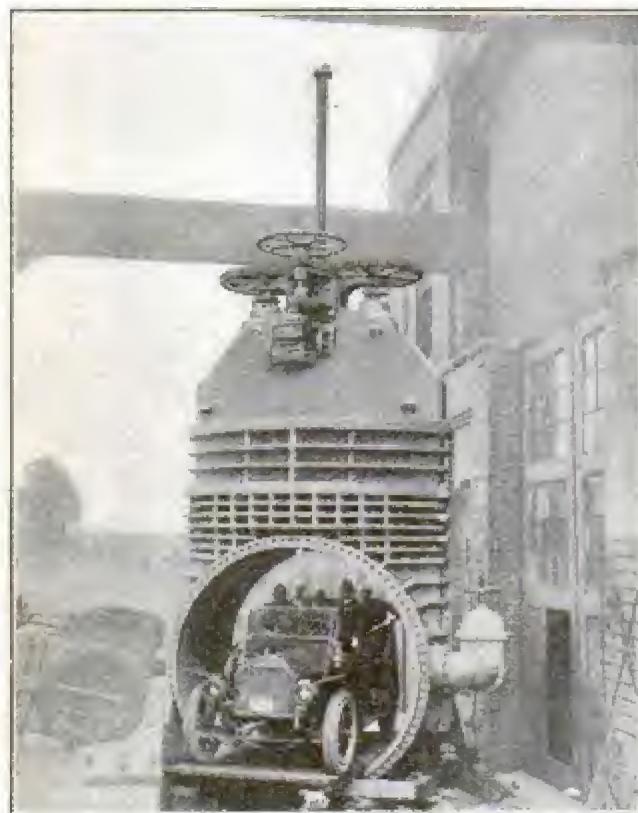


A MIGHTY SHADOW

THIS remarkable photograph was taken at noon from the visitors' gallery of the Metropolitan Building, New York, after a heavy snowstorm. The shadow was cast by the tower of that skyscraper, and it extends from the corner of Madison Ave. and 23rd St. to Broadway and 26th St., a distance of about five blocks. Fifth Ave. may be seen in the middle foreground.

THE LARGEST VALVES IN THE WORLD

The three huge gate valves constructed to control the water used to



Touring Car Passing Through Waterway of Huge Valve
drive the 12,000-hp. turbines of the Ontario Power Company at Niagara Falls, are undoubtedly the largest in the world. They have a waterway diameter of 9 ft., weigh 130,000 lb. each, and in actual operation each will be under a pressure of more than 550,000 lb.

Two flat cars were required for the transportation of each valve. The overall height of the valves is 30 ft. 3 in.; the width, 11 ft., and the total thickness over the flanges is 6 ft. 8 in. The body is of cast iron and the gate of cast steel.

The raising of the valve gate is accomplished by means of two tobin-bronze spindles, 12 ft. 3 in. long, and 4½ in. in diameter, with threads having a 2-in. pitch. These spindles are operated through gearing by a 15-hp. motor, the operation of completely opening or shutting requiring three minutes. A 14-in. bypass valve is provided for relieving the water pressure when opening or closing the valve.

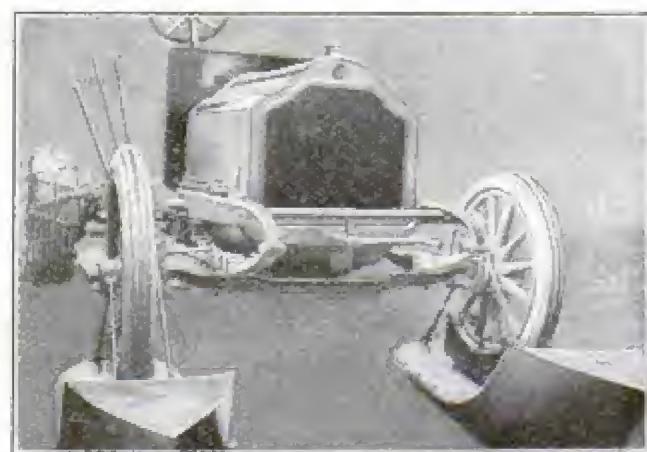
ARMY WILL USE WIRELESS AT WESTERN POSTS

Wireless telegraph is to be the means of communication between army posts in the West, according to the latest plans of the War Department. Orders have been issued from Washington to the commanding general of the department of the Missouri, at Omaha, to discontinue the use of commercial telegraph lines for the transaction of government business between Omaha, Ft. Leavenworth and Ft. Riley, Kans. Stations are also being installed at Cheyenne, Denver and other important military posts in the West.

MOTOR SLEIGH FOR RUSSIAN EMPEROR

The motor sleigh for the Emperor of Russia received the highest awards of the French Automobile Club, the gold medal of the French Touring Club, and the gold medal of the Imperial Russian Automobile Club.

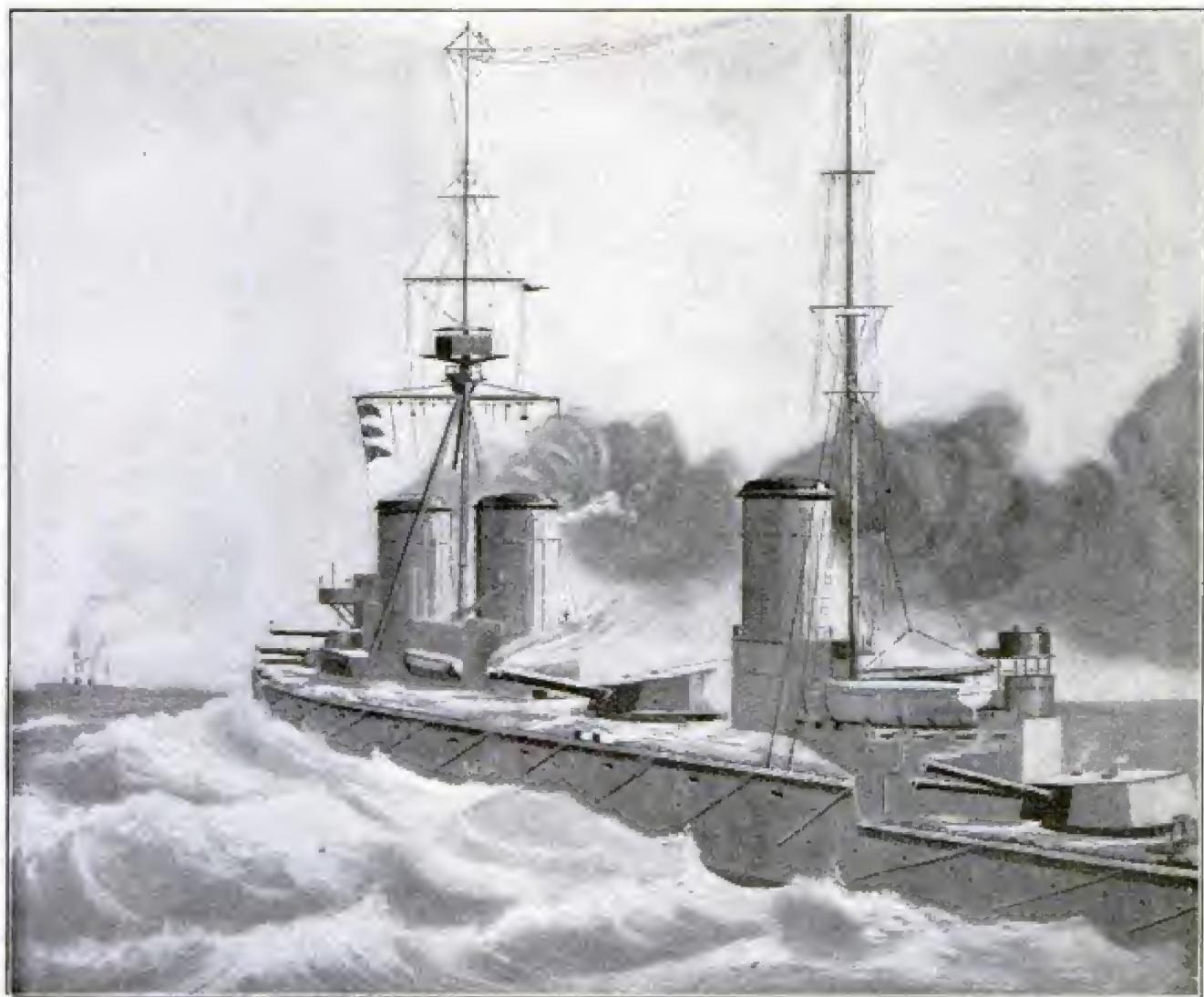
The machine may be used either as a wheeled vehicle or as a sleigh, the front wheels being carried on boat-like runners when used as the latter. The drive wheels, which have dual tires, are shod with anti-skid chains.



The Czar's Motor Sleigh

and inside of the wheels are emergency runners to keep the wheels from sinking too deep into the loose snow.

¶The first financial failure on record of a concern engaged in the exploitation of aviation occurred in Paris recently.



Courtesy the Sphere, London

Newest Type of Fighting Machine.—Designed to Strike Heavy Blows and Run. Every Possible Piece of Superstructure Has Been Dispensed With

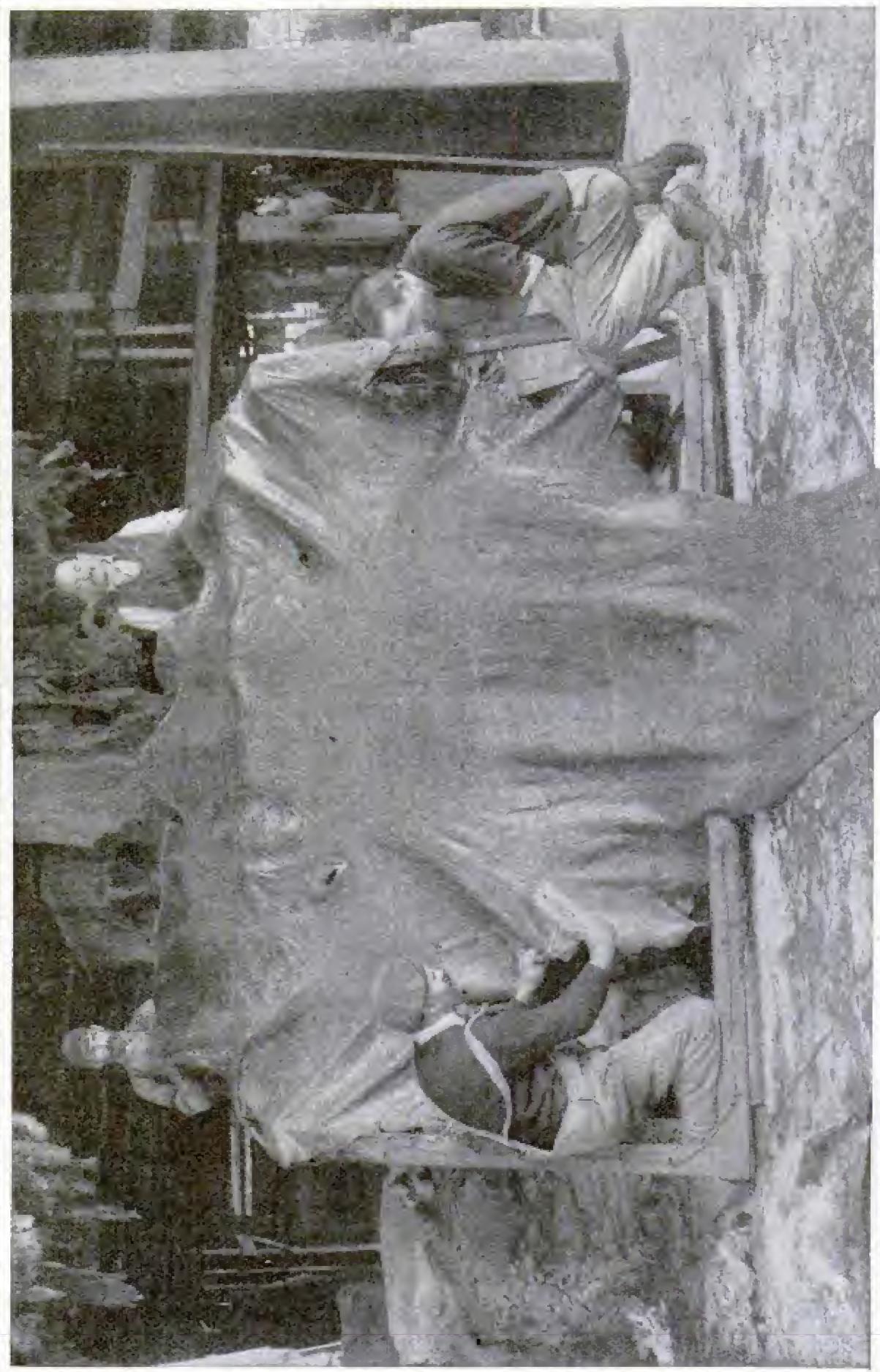
GREAT BRITAIN'S NEW BATTLESHIP-CRUISERS

Great Britain's "Princess Royal" type of battleship-cruisers, now under construction, present as great a revolution in sea fighting machines as did the first "Dreadnought."

Driven at a speed of 30 knots (approximately $34\frac{1}{2}$ miles an hour) and provided with a main battery of eight 13.5-in. guns, these wonderful fighting machines could, it is said, meet and severely punish the most powerful British battleship now in commission without much risk of being harmed in return. To make the point still clearer, the battleship-cruiser, driven at high speed by its turbines, could maneuver at a distance of from 500 to 900 yd. beyond the effective range of the 12-in. guns of the present dreadnoughts and hurl her own projectiles home.

The eight 13.5-in. guns of the battleship-cruisers are on the center line, and can be fired on either broadside, while four may fire ahead, and two astern. The bridge and superstructure have nearly disappeared on these ships, and only a single tripod mast and a light mast to carry the wireless aerials and signals are in evidence. The big-gun barbettes instead of being round, have a series of angles to throw off the enemy's shells.

Experiments now being made at Johns Hopkins University on the analysis of the fundamental tones and partials that make up every musical sound are expected to lead to a method for determining the value of violins and similar instruments by their tone.



SMITHSONIAN INSTITUTE TAXIDERMISTS PREPARING HIDE OF HUGE

ELEPHANT SHOT BY COL. ROOSEVELT IN AFRICA

CANARIES ACT AS MINE-GAS DETECTORS

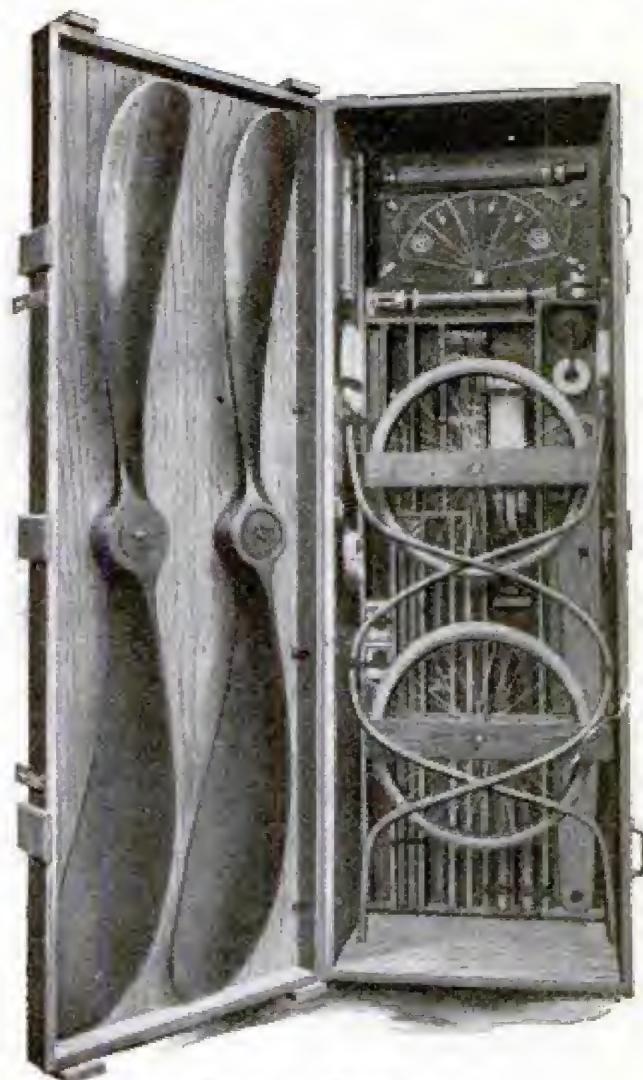
Caged canaries played a prominent part in the attempts made to reach the men suffocated by the explosion which occurred in a coal mine a few miles from Manchester, Eng., recently. Picked men from all the pits in Lancashire were rushed to the Pretoria pit, and gang after gang attempted to penetrate the passages and galleries. At the head of each gang or relief team were six men equipped with breathing helmets whose duty was to repair the broken ventilation doors so as to restore the thorough ventilation of the pit, and to report the first indications of gas. Their lamps, of course, gave them an idea as to the condition of the air, but in addition they carried canaries in cages, as these birds show signs of distress at the first presence of gas.

The Pretoria-pit disaster was the worst in England in many years, some 360 miners, among whom were many boys, being killed. The mine was one of the best equipped in Great Britain, the coal being mined by electric cutters instead of by blasting or shot-firing.

SPARE-PART OUTFIT FOR AEROPLANES

Just as the automobilist carries spare tires, spark-plugs, bolts and nuts, split pins, and other parts to make replacements when breakages occur in the use of the machine, so the airman today provides himself with an assortment of "spares." He does not carry these on his aeroplane, however, although the time may come when it will be possible to reduce their number to such an extent that they will not be a prohibitive burden even for heavier-than-air flying-machines. The French manufacturers of the Bleriot monoplanes now supply spare parts for their machines put up in neat arrangement in a wooden chest, with locks and suitable handles to facilitate handling in shipping by rail and boat. As exhibited

at the recent French aerial exhibition in Paris, the case contains two extra propellers, a pair of landing wheels and



An Emergency Set for Airmen

two pieces of bent bamboo used to support the tail, finished parts for the frame, stranded steel cable in coils, and a multiplicity of small metal parts for different parts of the framework.

RADIUM REDUCED TO \$75,000 A GRAM

Radium in "bulk" can now be bought comparatively cheap. The Austrian Ministry of Work recently sold Sir Ernest Cassel a gram of the precious stuff, for presentation to the English Radium Institute, for £15,000 (nearly \$75,000), "a price specially reduced on account of the large quantity purchased."

The radium will be used for cancer research.



That Night the Tide Reached the Schooner and Slowly She Slipped from the Sand

FIGHTING ARCTIC PERILS WITH AN IMPROVISED STEAM SHOVEL

The remarkable story of how a resourceful skipper, applying his slight knowledge of mechanics, saved his ship after she had been thrown high and dry on the Alaskan Coast

By J. E. BECHDOLT

PITTING natural forces against natural forces, boasting a little now and then with an improvised "steam shovel," when nature seemed to lag a bit behind, Capt. E. D. Hoffman overcame obstacles created by the Arctic seas and gales, and brought his schooner the "P. J. Abler" into Seattle after the vessel had been wrecked, piled high and dry on the beach at Goodnews Bay, Alaska, and locked securely up for the winter by the Arctic ice pack.

A mariner whose experience was gathered in more years than he cares to admit, with a spirit of adventure which had made him a soldier of fortune in many lands and carried him through many tight places, Captain Hoffman also possesses a knowledge of mechanics that stood him in good stead when he found himself, after a heavy

storm, securely beached on the Alaskan coast a few months ago. It required 21 days to extricate his ship from her perilous state, but the task was accomplished in a manner so novel that but for photographs of the various stages of the work, even the doughty captain's word might naturally be doubted.

The "Abler" sailed north from Seattle on Sept. 22, on her third voyage of the season, with government school supplies for Hooper Bay, Kodiak and Goodnews Bay. The last of the load was discharged at Goodnews Bay, near the mouth of the Kuskokwin River in Bering Sea. While the schooner lay at anchor in the bay on Nov. 1, a terrific gale blew up out of the North, and sweeping down Bering Sea struck the poorly sheltered harbor with spiteful violence. The "Abler" had been anchored under the shelter of the one

large hill, but no anchor made could withstand the strain put upon it by the gale.

The force of the wind was so great that a pile of 6 by 8-in. timbers which had been neatly piled, was scattered high in the air, many pieces being found at a distance of 600 ft. from their original location.

During the night, the "Abler" dragged anchor and was swept across the harbor to the southern side where she was driven on the sandy shore.

During the following day, the surges continued to lash the beach and when the storm had subsided, the schooner, which had offered a barrier to the shifting sands, was almost buried under tons of sand and gravel. On the side of the boat nearest the water the crew could stand on firm ground and look down into the hull.

Captain Hoffman saw at a glance that the schooner was being buried deeper with every passing hour, and he knew that a way had

to be found to dig out the vessel if he ever hoped to sail her again. To do this work by hand would take so long



Digging the Schooner Out of the Sands
—Note Improvised Steam Shovel at Right



Capt. E. D.
Hoffman



Improvised Steam Shovel at Work

that before it could be completed the Arctic ice pack would have locked the Bering Sea as far south as Unimak Pass and made navigation impossible. With the material at hand the shipwrecked men must extricate their schooner, and that very quickly.

All hands discussed the situation. Edward Adam Born, owner of the "Abler," who was acting as chief engineer, made the suggestion which led to Captain Hoffman's invention. The owner thought that a scoop might be rigged by which the men could dig out the sand in large quantities. Then the captain startled them by announcing that he had a steam shovel to do the work.

The men were put to work at once, rigging up the captain's "steam shovel." A gasoline "drum" was

sawed in two parts diagonally, making of each half a scoop shaped very much like that which a grocer uses to scoop sugar. The "Abler" has a gasoline-driven winch at the bow which was used for handling heavy cargo and lifting anchors. On the winding drum of this winch Captain Hoffman coiled a long cable. The free end of the cable was strung through a block at the head of the foremast, along the mainmast head through another block, and thus to the aftermast where the line came down to a block rigged at the end of the spanker boom, which was swung out astern.

The free end of this cable was then made fast to the scoop which had been rigged with handles so that a man could guide it. The scoop was dragged to the forward end of the schooner and the winch started. With a sailor to guide it, this power shovel made short work of the heavily packed sand. In ten days the schooner had been uncovered and stood, clean to the keel, at the head of a little canal leading down to the water.

However, the tide did not reach the schooner until 20 days after she stranded. While the steam shovel work was in progress, the storm was followed by intense cold. The Bering Sea ice pack, driven by the squall, reached Goodnews Bay within a couple of days after the blow, and by the time the schooner was uncovered, the bay was frozen hard to a depth of several feet.

While part of the schooner's crew was making ready for sea, others, under direction of Captain Hoffman, were preparing for an overland retreat. They traded with the natives for five good sledge dogs, a sledge and outfit for the trail. Captain Hoffman planned, if driven to it, to desert the ship and travel with the crew from Goodnews Bay to Togiak, inland to Lake Iliamna, across the lake and into Iliamna Bay in Cook Inlet, out of the reach of the Arctic ice, and a point of call for a steamer.

Until Nov. 21 the "Abler" lay on the beach and the waters of Goodnews Bay

continued frozen fast. The thermometer registered far below zero, varying occasionally as the winds blew with the frozen breath of the North. All but the captain had abandoned any idea of sailing back to Seattle and were bending their energies toward preparations for the trail.

Captain Hoffman was figuring on just one chance, that occasional miracle of the arctic, the "chinook," a south wind which sometimes blows in the heart of winter, bringing warm weather and melting the snow even at Dawson City, in the heart of the Klondike.

Luck favored the skipper. On the morning of Nov. 21 he came on deck and sniffed the air.

"We put to sea tonight," he announced to his incredulous shipmates.

Before noon the wind was blowing steadily from the south, a soft, balmy breeze. By afternoon the mercury in the thermometer had climbed out of hiding and registered 46 degrees above zero. The ice broke up quickly. That night the tide reached the schooner and slowly she slipped from the sand. She was hauled into deep water and anchored.

Next morning another difficulty confronted the "Abler." While the schooner was on dry land the propeller shaft had frozen tight in the sleeve. There was not a moment to lose, for at any time the Arctic ice pack might again close in. It was impossible to get at the frozen part, so Captain Hoffman rigged a chain lever around the shaft, put a long stout wooden lever into that and fastened the upper end to the spanker boom, giving him a double leverage on the shaft. This leverage was enough to either break the shaft or turn it over. Fortunately it turned.

The "Abler" got out of the ice under power and once her nose was in Bering Sea the wind favored her. She made the run from Goodnews Bay to Seattle in 18 days, logging about 200 miles a day under sail.

CA blacksmith in Los Angeles recently broke his neck while trying to button on his collar.

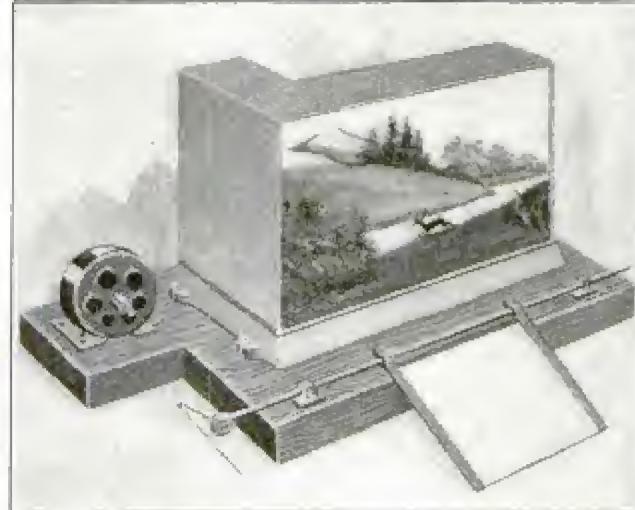
AN ELECTRICAL RECORDING TARGET

An automatic electrical recording target, developed especially for indoor shooting with miniature rifles, has recently been introduced by an English firm. It consists of two principal parts, a recording or object target, and a reproducer or indicator target.

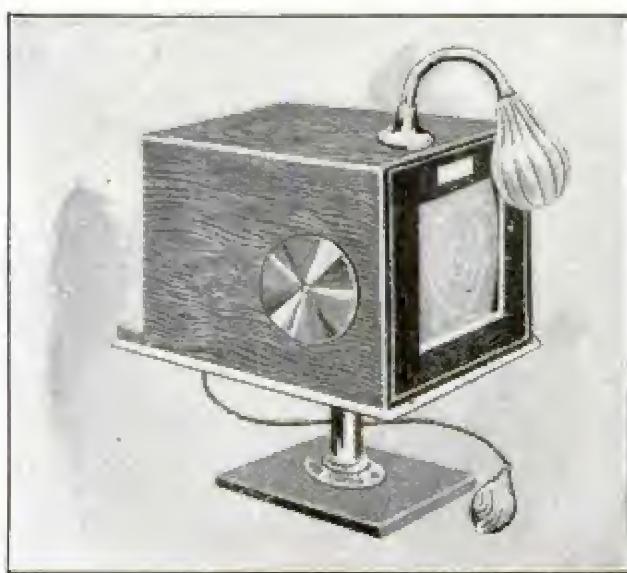
The object target contains a roll of paper, which is perforated by the rifle bullet. The position of the hit is recorded electrically on the reproducer target by means of a small white disk moving behind a transparent facsimile of the object target.

The motion of the disk is effected in the following manner: When the shot is fired, a small hole, E (see bottom right-hand cut), is made in the paper roll. The electric current is then switched on. This causes the paper to unwind from roller A, around speed roller B, and on to receiving roller C. In this move-

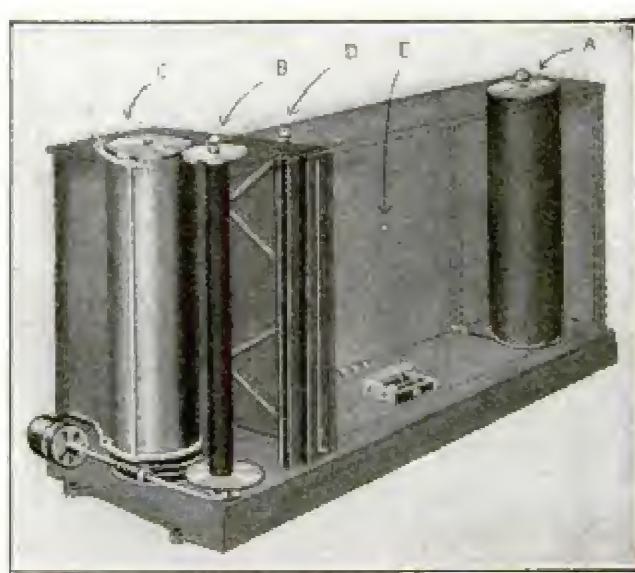
ment, the hole passes under a row of electrical contact fingers, D. One or more of the fingers will thus pass through the hole and establish another circuit which stops the mechanism, and at the same time causes an instrument in the reproducer target to move the small white disk up or down a distance corresponding to the vertical position of the bullet hole. The horizontal displacement of the hole is simultaneously transmitted either mechanically (by means of a cord or belt) or electrically to the reproducer target. Thus the final position of the white disk behind the transparent reproducer target indicates the exact position of the bullet hole in the object target. It will be obvious that it does not matter whether the object target be fixed or moving, for the relative position of the actual and indicator targets is always the same.



RECORDING OR OBJECT TARGET
Shown adapted for use as moving target. Bull's-eye
is folded down

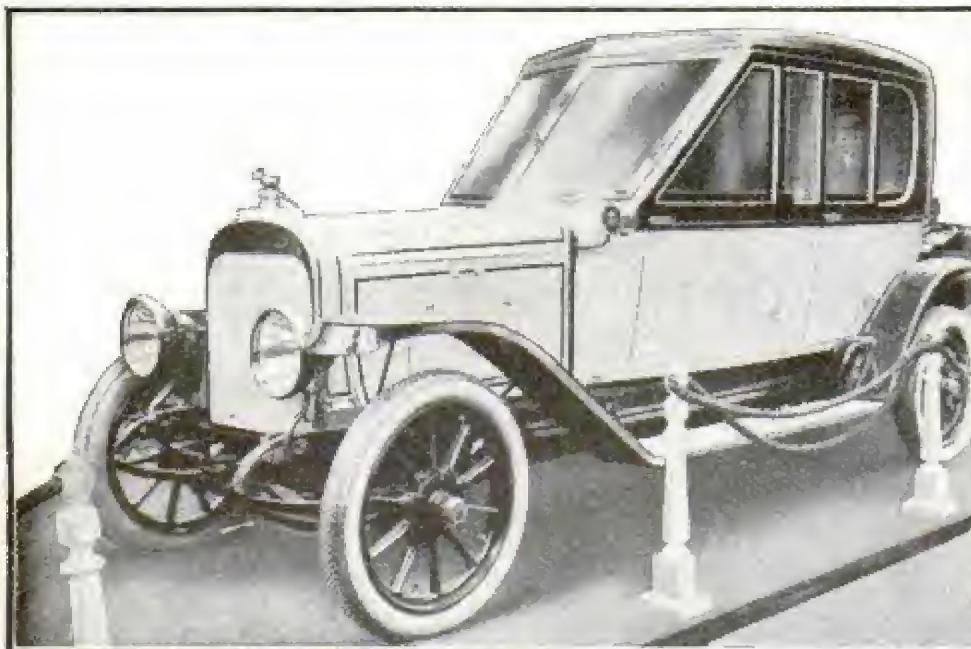


REPRODUCER OR INDICATOR TARGET
Target is transparent, and small white disk behind
it shows position of hit

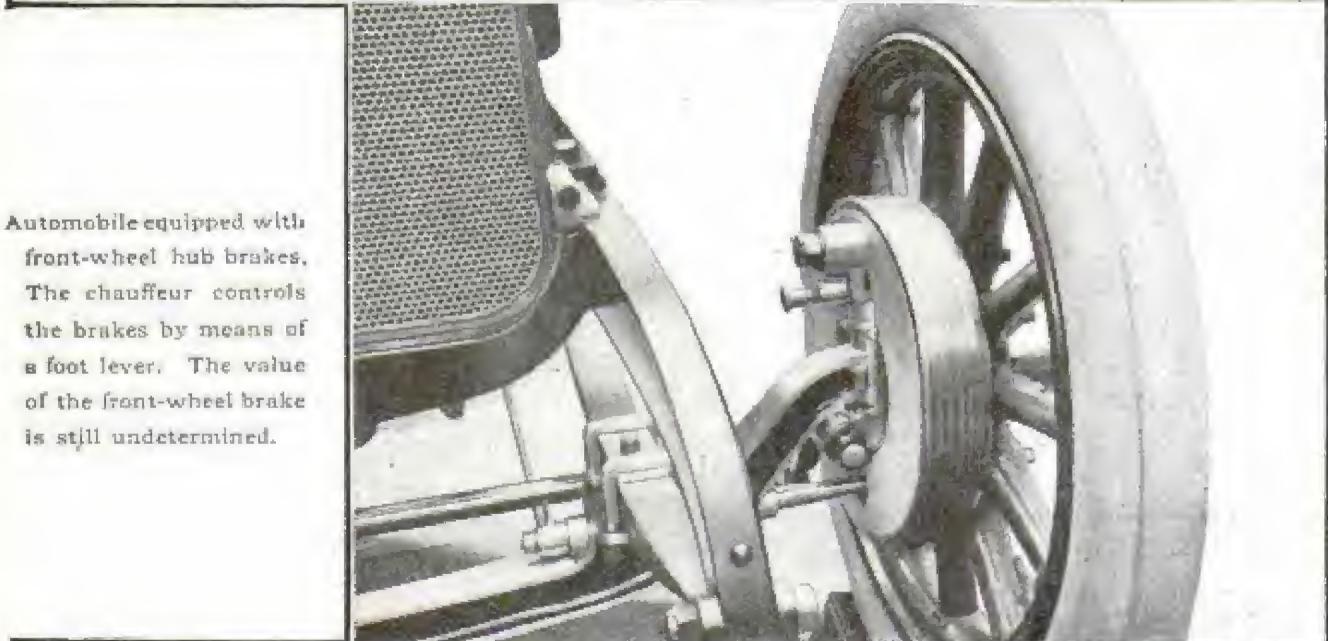


PAPER ROLL MECHANISM
Shows interior of the recording or object target and
movable paper roll

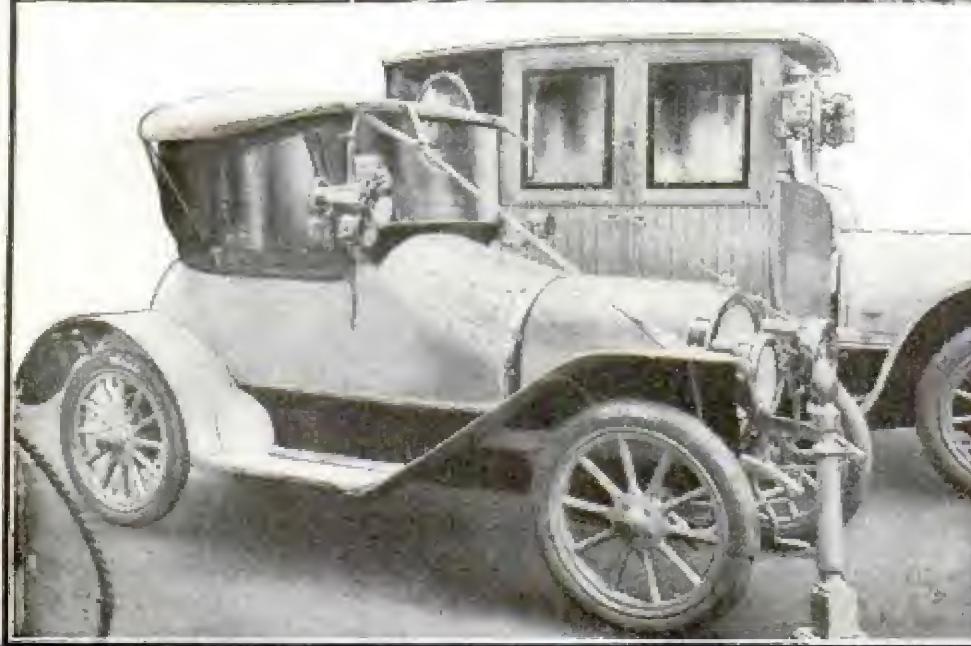
Some of the Most Interesting Ideas Which Were



A touring car with sloping front panels completely inclosing the chauffeur without carrying the body too far forward. This design gives the whole a graceful appearance, and decreases wind resistance.



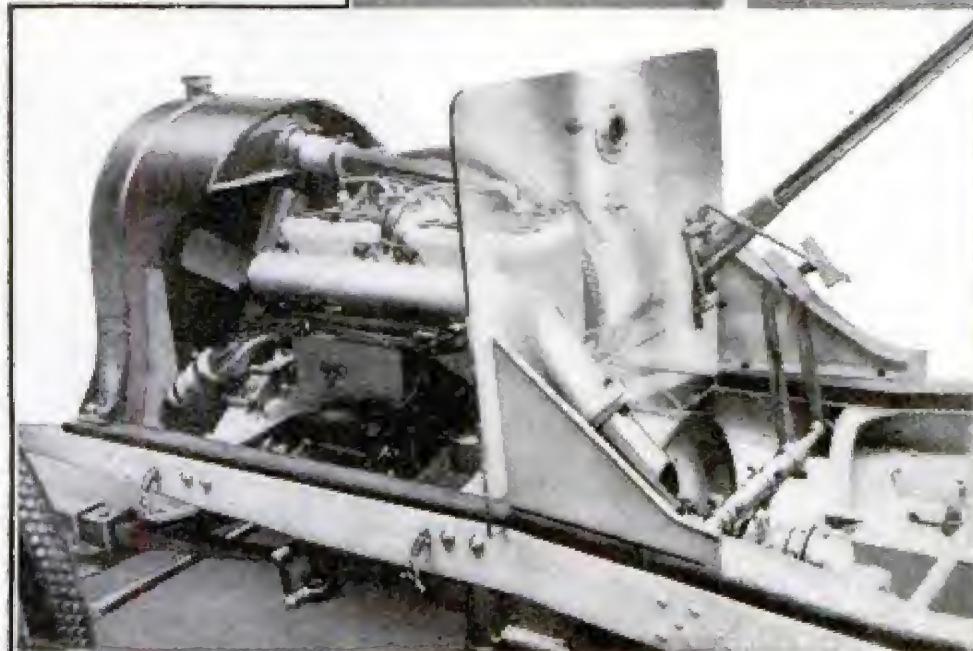
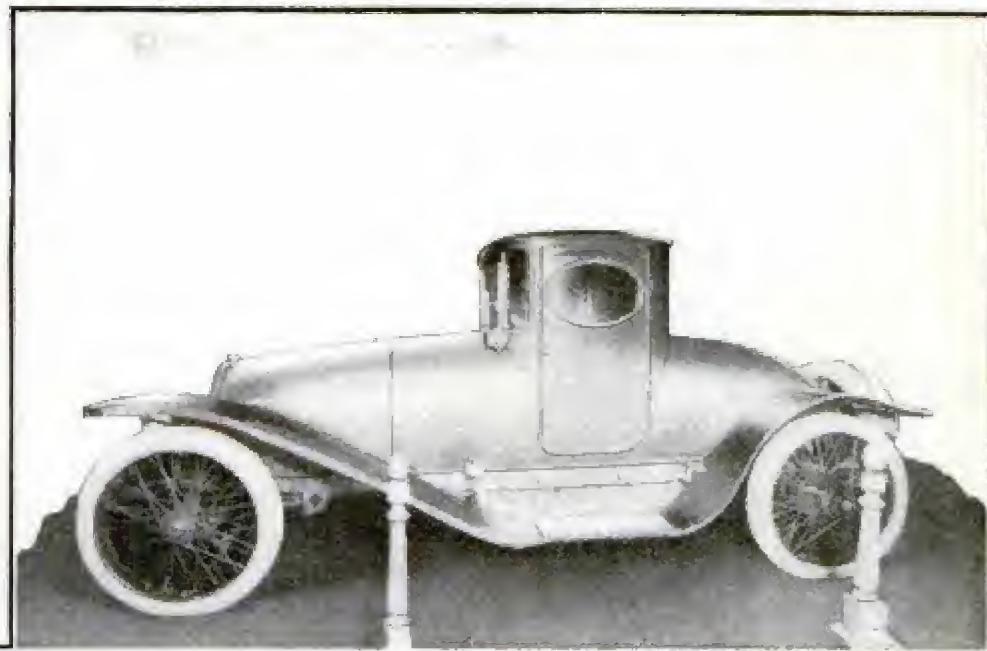
Automobile equipped with front-wheel hub brakes. The chauffeur controls the brakes by means of a foot lever. The value of the front-wheel brake is still undetermined.



Gentleman's roadster, provided with completely inclosed, collapsible hood. The body of the car has a scuttle dash, the inner end of which carries the windshield supporting the top.

Displayed at the Recent Automobile Exhibit in Paris

Submarine type of body in which two persons can sit absolutely at ease even when running at 50 miles an hour. Pilot house has large, curved front window and oval windows in sides.



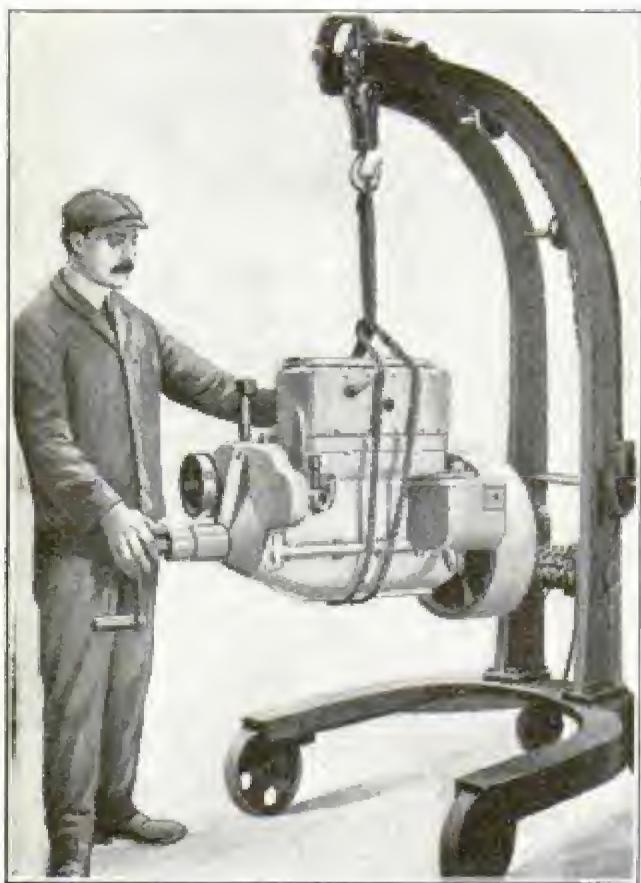
Motor of 4-cylinder, 24-hp. type with glass dash through which the driver may glance at mechanism at any time. Bonnet is removed to show side view of engine.

The body of this double compartment automobile is patterned after the stage coaches which were once the principal means of travel in Europe. Coaches of like shape are still used in Spain.



A SERVICEABLE TRAVELING HOIST FOR GARAGES

Traveling hoists of this type are now included in the general equipment of garages. It is surprising what number



Portable Garage Hoist

of tasks they can be made to perform, such as lifting out and transporting motors from place to place, and raising one side or end of an automobile. The U-shaped truck makes possible the handling of objects in awkward places.

PIECE OF BROKEN WHEEL WRECKS CAR INTERIOR

A section of a broken car wheel partially wrecked the interior of a passenger car on a Long Island railroad recently, when the wheel broke while the car was in motion. The jagged piece of steel which came into the car was about one-third of the wheel, and tore its way through the car floor directly under the seat of a woman passenger. She was hurled over the seats in front of her, half the length of the car, striking against an iron post, breaking her ankle. The section of the wheel tore up the flooring and the seats in the immediate vicinity and struck the roof, wrecking the whole rear section of the car.

WALKING-STICK WEAPONS CARRIED BY PARISIANS

Sword canes have been in existence for many years, but the makers of weapons in Paris have extended the idea to include daggers, bayonets, revolvers and guns, all hidden in harmless-looking walking sticks.

The gun cane is provided with a metal stock for steadyng it when shooting, while the revolver cane has a dagger attachment, to be used should the bullets fail. The mechanism of the cane and bayonet combination is such that a single movement brings the weapon out of the head of the stick.



The Cane Bayonet at Head of Stick

French Walking-Stick Gun

Revolver, Dagger and Cane Combination

BEEHIVE USED AS CHICKEN INCUBATOR

Finding that the temperature in a beehive was exactly the same as that required for hatching eggs, an American living in Rome conceived the idea of letting his bees do the hatching. He built a rectangular frame, provided it with a linen bottom, placed 20 eggs, protected by a perforated cover, spread over and around them, in the box, and placed the whole in the highest section of the hive. In course of time, 18 of the eggs were successfully hatched, without in any way preventing the bees from following their normal pursuits.

Repeated experiments proved that a dozen eggs at a time can be successfully hatched in this manner, and that in the course of a season one hive could produce more than 80 chickens.

USEFUL CONTEST IDEA FOR AEROPLANES

The Marquis de Dion, who is noted for his work in connection with the development of the internal-combustion engine, has recommended a "greatest difference" competition for aeroplanes. This means the award of a prize for the aeroplane that can fly the fastest and also the slowest, the winner being the airman who can show the greatest ratio of his fastest and slowest average speeds over a given distance. The idea has been approved by the French aeronautic authorities and a race along these lines will be included in some competitions in France next season.

OBSERVATION TOWER FOR MILITARY OPERATIONS

German military experts have recently devised a number of different portable observation towers that can be carried by troops and set up for use in a few minutes. The latest tower consists of a heavy base which contains numbers of parts which are fitted together automatically to make the

pedestal on which the observation platform is placed, and which can be raised or lowered at will. This platform is made of a size sufficient to accommodate eight persons and can be elevated 150 ft. above the level of the ground



New Observation Tower Devised by Military Experts

on which the base rests. The platform is fitted with steel sides or shields that can be raised to a height of 5 ft. 6 in. to protect the persons using it.

Special street cars during rush hours for "ladies only" are being considered by the town council of Melfort, Sask.

A lawyer of Sterling, Ill., recently recovered \$10 damages from the telephone company of his town because the company failed to put his office address in the telephone directory, as well as the address of his residence.

BRIDGE IS WRECKED BY AUTOMOBILE

Struck by a heavy automobile bus late one night, this bridge, over the



Bridge Wrecked in Remarkable Manner

Naugatuck River above Thomaston, Conn., collapsed two days later when the machine was pulled out. There is

a rather sharp turn at one end of the bridge, and the car, either from skidding or unskilled guidance, collided with an end post of the bridge, forcing the support off the bridge seat. The bridge was of the double-parabolic type, with an 85-ft. span.

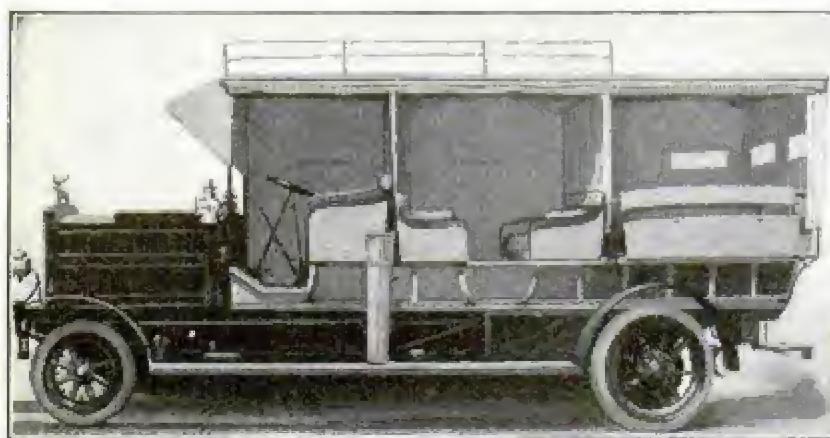
CONCRETE AND MORTAR FROM VOLCANIC DEPOSITS

Owing to the high cost of transportation, a new mortar and cement has been developed locally for building the Los Angeles Aqueduct. This is made from tufa, a volcanic deposit consisting principally of silica, alumina, lime and magnesia, and occurring in the vicinity of the work in great quantities.

It was found that tufa from the Mojave Desert, when finely ground and blended with slaked lime, forms a mortar which becomes hard when set in water. Tufa cement, made by mixing ground tufa with Portland cement, when mixed with standard sand in the proportion of 3 to 1, develops as much strength in 28 days as the standard sand briquettes made with standard cement in the same ratio.

AUSTRIAN MOTOR HUNTING CAR

One of the latest types of automobiles constructed in Europe is this Aus-

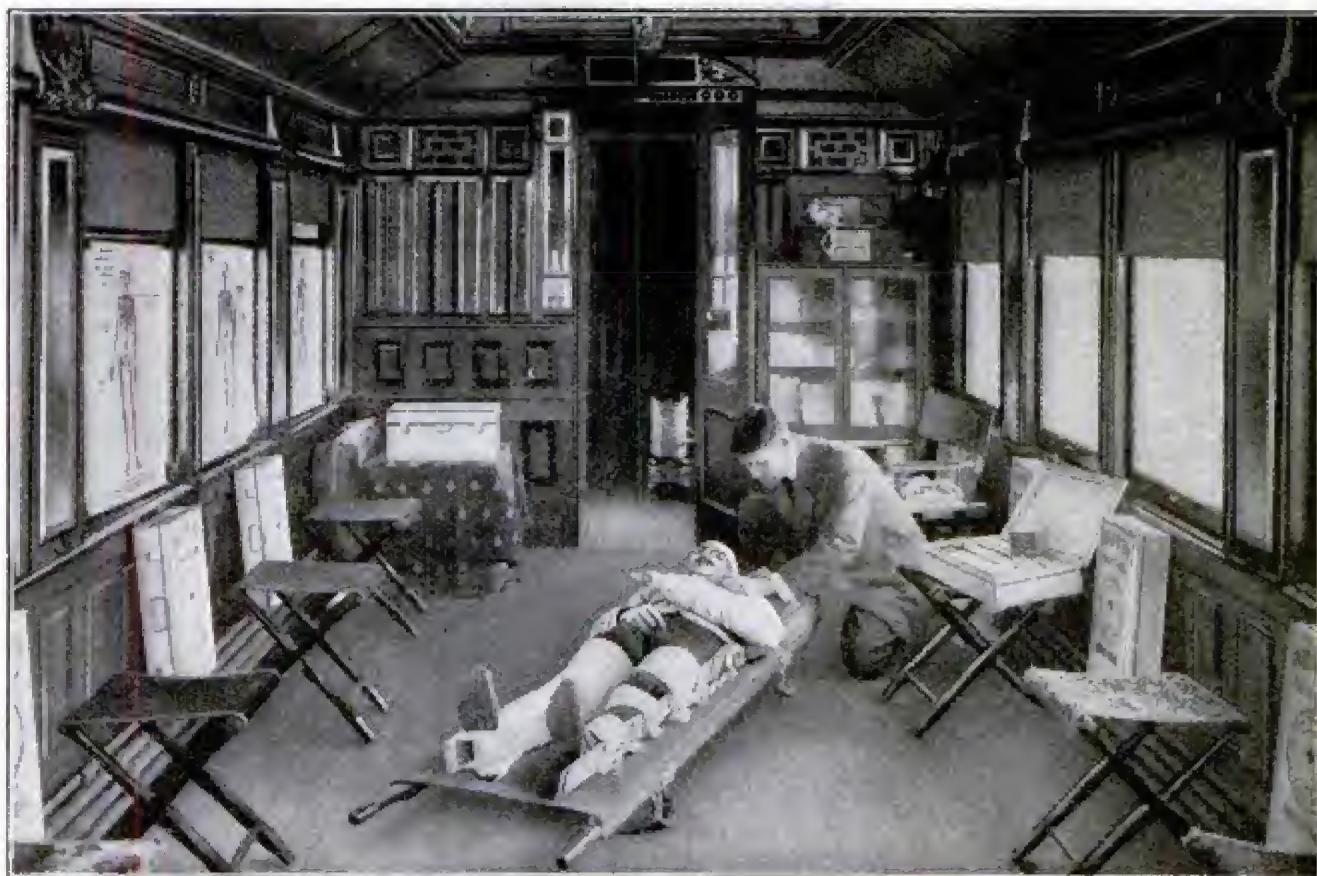


Austrian Hunting Automobile Carries 14 Persons

trian motor hunting car. It has separate compartments for the sportsmen

and professional hunters, a rifle stand for 12 rifles, storage room for 4,000 cartridges, the hunting breakfast, camp-stools, knapsacks, etc., and accommodation for the hounds. The car is expected to carry 14 persons, this number including six sportsmen, six huntsmen, a valet and the driver. Storm curtains, provided with celluloid windows, protect the occupants from wind and rain. Speaking tubes leading from the sportsmen's compartment afford ready communication with the driver and hunters.

RED CROSS CAR A SCHOOL FOR FIRST-AID WORK



Practical Demonstration of First-Aid Work in the Red Cross Society's Traveling School. The Rectangular Boxes on the Sides Contain Modern First-Aid Outfits

A nation-wide campaign of education in the principles of first-aid work has been inaugurated by the American Red Cross Society and is being carried out with unusual thoroughness. Instruction is carried right into the railroad shops and factories by experts who are traveling through the country on a special car fitted up by the society with every known appliance for rendering immediate relief to the maimed and injured.

The car is a complete hospital and lecture room. Instruction is given in the use of the simple devices carried in first-aid boxes, and practical demonstrations of the various types of dressing are made.

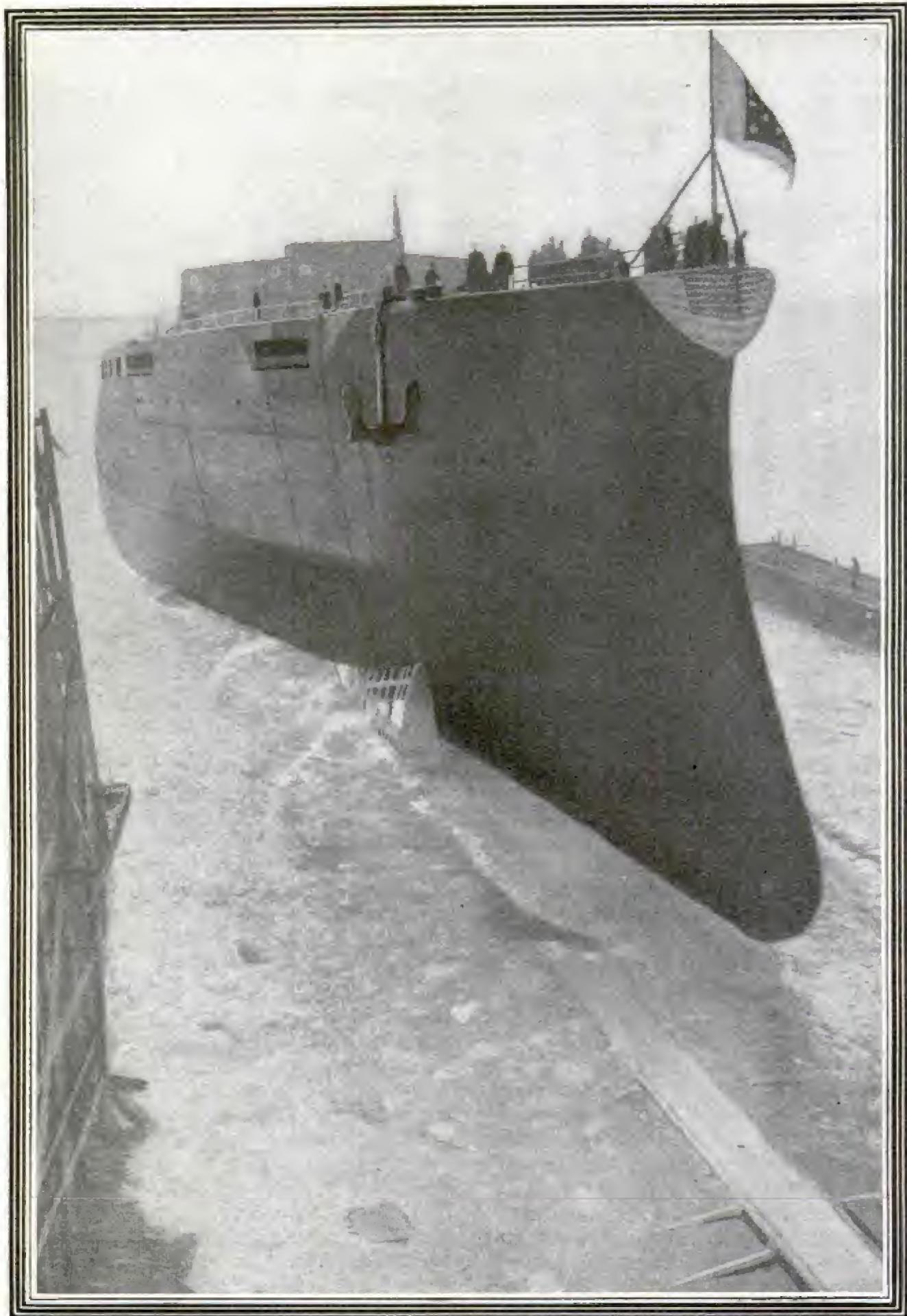
The Red Cross car is under the charge of experts and the railroad companies think so well of the plan that no charge is being made for transportation.

The car is of the ordinary Pullman type but has been entirely remodeled, every up-to-date appliance known to

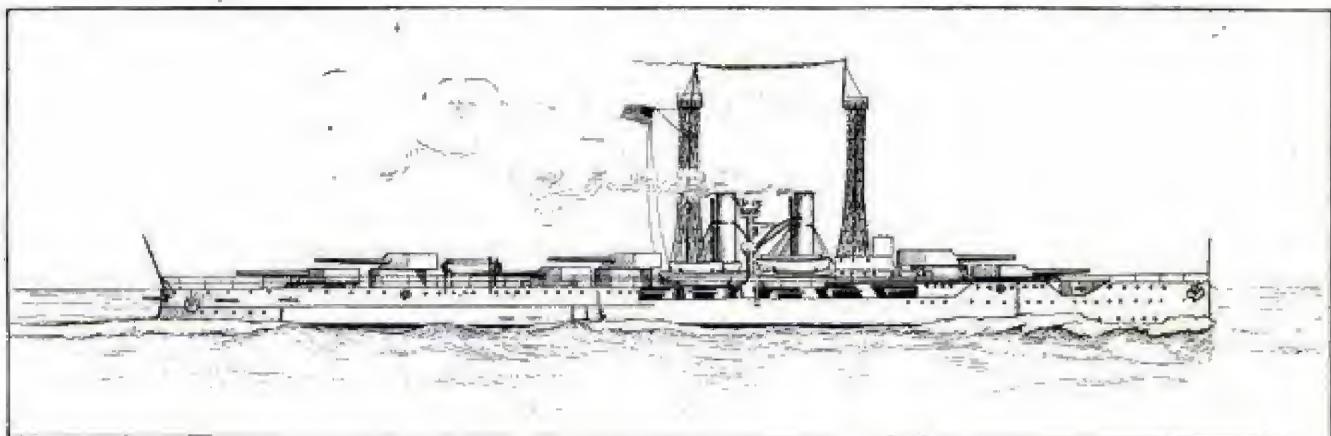
science for the relief of the injured being installed in the various compartments. Folding chairs are provided so that one of the larger compartments may be turned into a lecture room.

The car is run into the railroad shops for the lectures and demonstrations and is also taken over the factory sidings for the benefit of the workers in industrial plants. There is no time limit on the visit of the car to any particular place, the officials in charge being imbued with a desire to give thorough instruction and to remain in a place until the object of the tour is accomplished.

Captain E. S. Grogan, the African explorer, electioneered by wireless during the recent election campaign in England. He was on his way home from East Africa during the struggle, but wireless telegrams were received from him every day and posted up in his constituency.



The Great Battleship "Arkansas" as She Slid from the Launching Ways



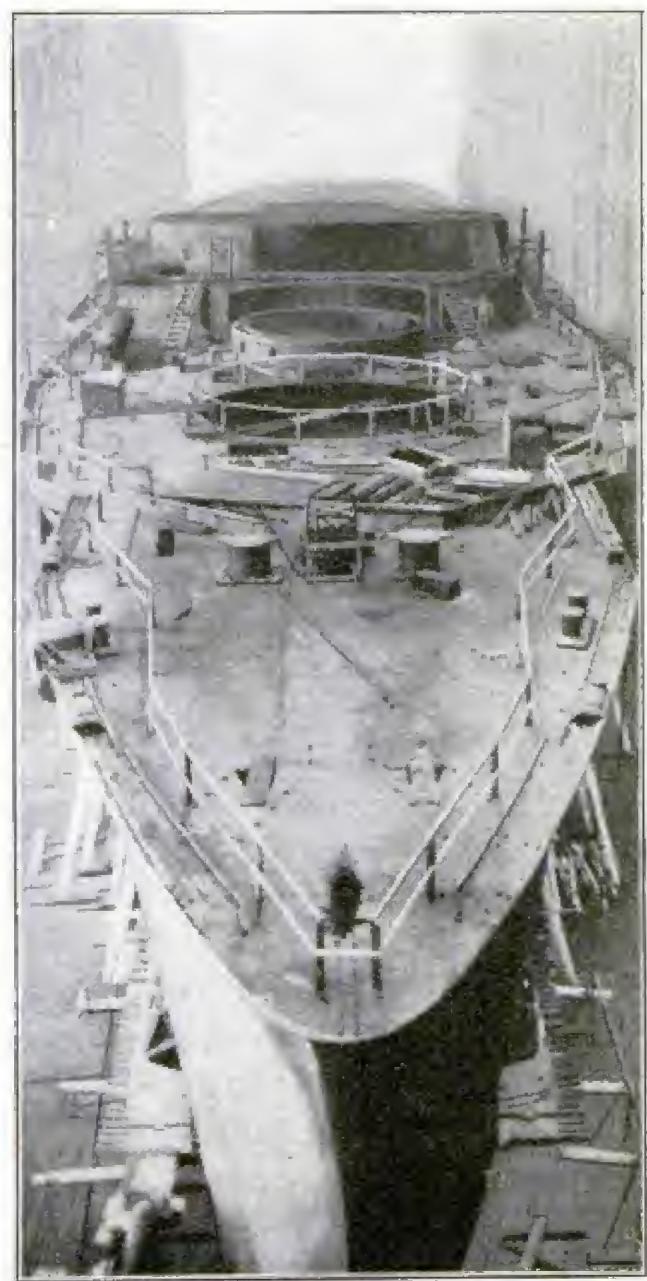
As the "Arkansas" Will Look When Completed, Showing Position of Main Battery Guns

UNCLE SAM'S GREATEST WARSHIP LAUNCHED

Destined to be the biggest battleship afloat, for a year or two at least, the great hull of the "Arkansas" was successfully launched at Camden, N. J., on Jan. 14. The big man-of-war will be of 26,000 tons' displacement, and the construction work alone will cost the government \$4,675,000. The ship will have the heaviest armament of any vessel in the navy, the main battery being equipped with twelve 12-in. guns and two submerged torpedo tubes. The main feature of the secondary battery will be twenty-one 5-in. rapid-firing guns. The "Arkansas" must be completed within the next 11 months to comply with the terms of the contract. On her trials she must have a speed of not less than $20\frac{1}{2}$ knots (23.6 miles per hour) and both coal and fuel oil will be used. The ship is 554 ft. long at the waterline and her extreme breadth at the same point is 93 ft. $2\frac{5}{8}$ in.

The "Arkansas" will be equipped with the new military fire-control masts which have become a feature in the navy since these masts withstood the test of gun fire on the monitor "Florida" several years ago. By carrying the supply of oil for fuel, the vessel may increase her speed in an emergency by flushing her coal with oil or by using oil for increasing her cruising radius. The total estimated cost is \$10,000,000.

The crew of the vessel will include 1,030 men and 86 officers, exceeding by 200 the men carried by the largest battleships now in commission.



The Deck of the New Battleship as It Looked During Construction. Note Bases for Forward Turrets

HOBBLED OSTRICHES

A hopple of the same type as that recently designed for use in conjunc-



The Hobble Prevents the Ostrich from Running Away

tion with the hobble skirt, although crude and totally lacking in elasticity, is used for hobbling ostriches in the Soudan, Africa. The hopple for feminine wear has as its purpose the confining of the stride so that the knees will not bag the front of the skirt. The hopples for ostriches prevent the big birds from running away.

SELDEN PATENT CLAIMS SET ASIDE

The independent automobile manufacturers won a victory, when the United States Circuit Court of Appeals in New York decided that the engine used by them was not an infringement of the Selden patent. This decision sets aside the claim that the Selden patent covered the engines used on all motor vehicles. The case was brought by the Association of

Licensed Automobile Manufacturers, representing 80 per cent of the manufacturers in the country, against the independent manufacturers,—those who had not troubled themselves to obtain a license from the owners of the Selden patent. The decision of the Circuit Court of Appeals reverses a decision of the United States Circuit Court.

The Selden patent was granted George B. Selden, Nov. 5, 1895, although application therefor had been filed May 8, 1879. It covers an engine of the explosion or internal-combustion type adapted to the propulsion of ordinary vehicles. Persons who desired to manufacture automobile engines were required to obtain a license from the Selden interests, so broad were the claims allowed under the original patent. Independent manufacturers asserted their belief that the Selden patent did not cover their engines, and it was to curb the activities of this group that the Association of Licensed Automobile Manufacturers began proceedings in the United States courts, alleging infringement. The case is now to be taken to the Supreme Court of the United States for final decision.

BUSINESS MEN'S COURT FOR NEW YORK

The New York Chamber of Commerce has decided to establish a commercial court by means of which business men who are members may settle all disputes among themselves. By virtue of a prior agreement to be entered into by both parties of the controversy, the commercial court's judgment will be as effective as that of the Supreme Court.

The main reason for the establishment of such a court is to avoid the delays which often extend over years in the law courts.

CA windmill-operated electric generator produces current for electrically lighting a church near Bilston, England.



Photo by Harris and Ewing

THE MULTIPLEX TELEPHONE INVENTED BY MAJOR SQUIER, U. S. A.

1, Battery Telephone; 2, Transformer Connecting Generator with Line; 3, Microphone Transmitter; 4, Transformer Connecting Receiver with Line; 5, Variometer for Tuning Receiver; 6, Variable Condenser for Tuning Receiver; 7, Audion Detector.

INVENTIONS IN TELEPHONY AND TELEGRAPHY

The discovery by Maj. George O. Squier, Signal Corps, U. S. A., of a method of sending many telephone messages over a single wire, all at the same time and without the slightest interference, is, according to many authorities on the subject of telephony, the greatest advance made in electrical communication since the invention of the Bell telephone. The underlying principle of this invention is the application of the methods of wireless telegraphy to the existing form of telephone apparatus.

By employing an electrical current which changes in direction many thousands of times in a second, electrical waves are set up in the ether surrounding the wire, and are guided through to their destination by—but not in—the wire, so that the system may be described as wire-

less telephony guided by a single wire. The number of direction changes of the current per second is called the "frequency" of the circuit. Major Squier has found that many currents of different frequencies may be sent—or guided—over the same wire without interfering with each other. At the other end of the wire these currents are picked off by instruments—called

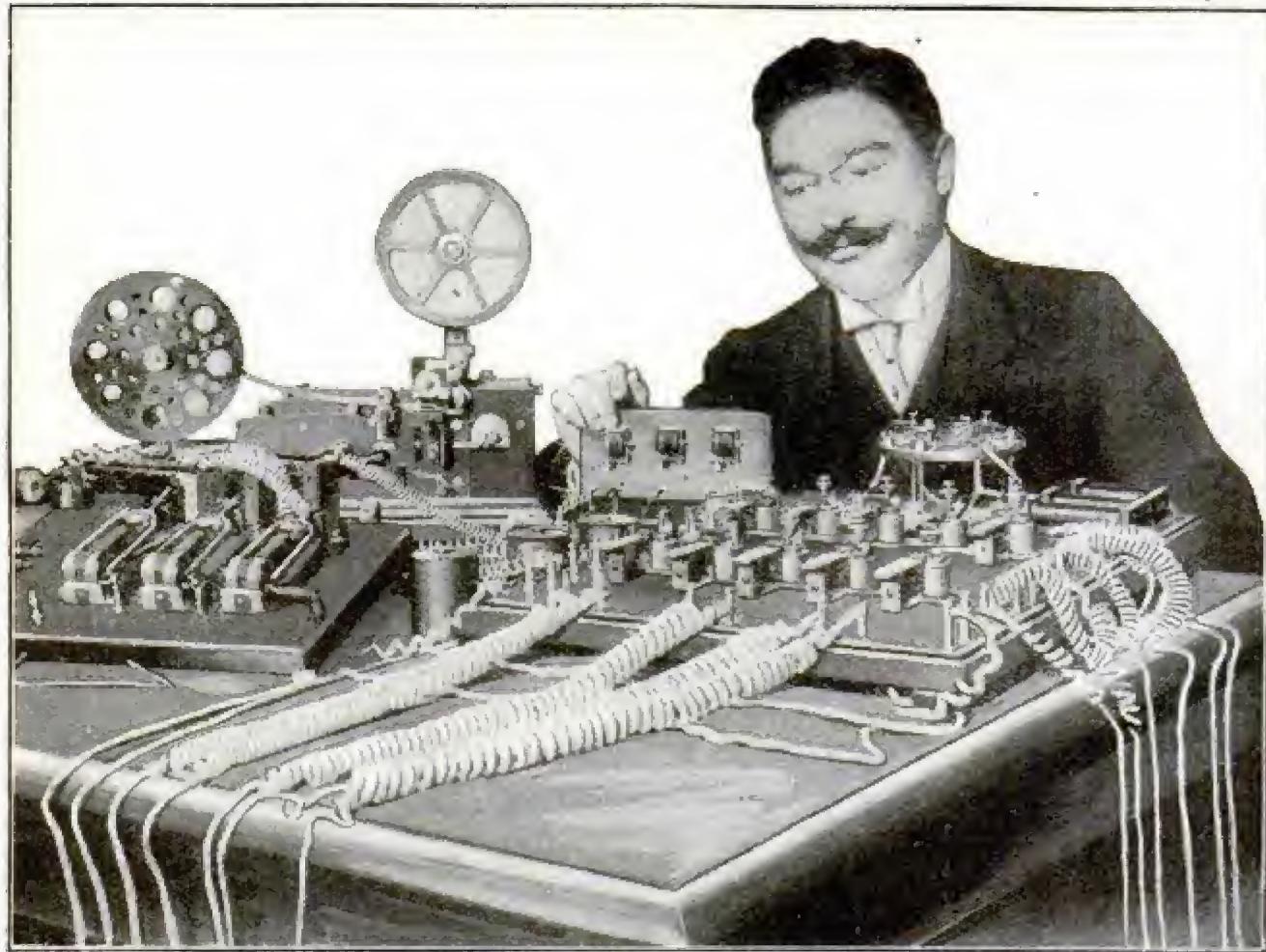
"detectors"—similar to those employed in wireless telegraphy, and each of these detectors is absolutely unaffected by any other current except the one that is "tuned," as it is called, to the frequency of the current which it is designed to pick up.

It is further reported that telegraph messages, transmitted with the usual form of key and received by the ordinary sounder, may also be sent simultane-



Photo by Harris & Ewing

Maj. George Owen Squier, Inventor of the Multiplex Telephone



Corrado Andriani, the Italian Inventor, and His New Multiplex Telegraph

ously over the same line, using the same method of selection and separation as with the telephone messages.

The importance of Major Squier's invention, which, although patented, is given freely to the people of the United States, is hard to determine at this

time, but its possibilities seem to be almost limitless.

Major George O. Squier is the chief assistant to Gen. James Allen, chief signal officer of the army. He is a graduate of Johns Hopkins University, where he studied under Professor Row-



The Two Receiving Stations of the Perry System—The Inventor is Seen Standing



One of the Transmitting Stations

land, inventor of a multiplex system of telegraphy. He is also well known in the field of aeronautics.

Following closely on the announcement of Major Squier's multiplex system of telephony and telegraphy, Frank L. Perry, an electrical man of Chicago, claims to have performed two years ago the feat of transmitting a telephonic message in one direction over a single wire, while another to-and-fro conversation was being held at the same time over the same wire. Mr. Perry's claims are corroborated by written statements from several well-known men, including Bion J. Arnold, a prominent engineer of Chicago. Mr. Perry is of the opinion that his invention will first find its greatest utility in the duplexing of lines longer than those found within city limits.

From Italy comes the report that Corrado Andrini has designed a multiplex telegraph that will send from 10 to 15 messages simultaneously over the same wire. This apparatus, which was finally perfected by Luis Maino, chief of the technical department of the Italian government telegraph service, was successfully demonstrated last December in the presence of several well-known scientists.

The Andrini telegraph is said to be comparatively simple and inexpensive, and to be supplemental to the telegraph systems already in use. It enables a single line to handle up to 500 telegrams an hour. Whether it will prove more acceptable to the telegraph companies than the now practically discarded Rowland multiplex system, remains to be seen.

FIVE-WHEELED AUTO HAS FLEXIBLE TRACTION

A curious automobile, for which much is claimed by its builders, has five wheels, four of which are of the ordinary horse-vehicle type, while the fifth is an adjustable, flexible drive-wheel. This traction wheel is claimed to cushion the automobile in a manner superior to rubber tires, the elasticity or easy riding qualities being under control of the operator, who adjusts it to suit the load or number of passengers by means of a lever in the same manner that he controls the speed.

Another important feature claimed by the inventor is the elimination of compensating gears and complicated mechanism, thus reducing the cost of output. The method of adjustability and flexibility are shown, the fifth wheel being supported by a shaft attached to a hanger. Two coil springs, adjusted by turn-buckles and provided with block and tackle

leading to the control lever or levers, hold the wheel against the running surface, the operator controlling the force exerted by the springs to suit conditions of road and load. Hanging drive-wheels of the same type are used for driving motor sleighs.

A naval constructor of the Japanese Navy is reported to have invented an aeroplane which will be able to alight on the water and rise therefrom.



Motor Sleigh Idea Adapted to the Automobile

INGENIOUS WAY OF GAINING DANCE PARTNERS

A novel cotillion figure in which toy balloons play a prominent part is be-



Courtesy Illustrated London News
Bursting a Balloon Secures a Partner

ing enthusiastically received in London. Each lady carries a toy balloon which must be exploded by stamping, jumping or falling upon it by the man who wishes to become her partner. When it happens that several men desire the same lady, a friendly contest ensues, often with laughable results.

AERO WIRELESS OPERATED OVER WIDE RADIUS

Henry Farman has successfully used wireless telegraph apparatus from an aeroplane over a radius of six miles. This feat was accomplished in France after many experiments. Farman believes he will eventually be able to extend the radius to 60 miles. The military possibilities of this accomplishment are almost limitless. An aero scout equipped with wireless could furnish information that would be invaluable. Even with a radius of six miles, his messages could be relayed by the ordinary field wireless equipment a distance of at least 30 miles to the commanding general, who would thus be enabled to plan his movements with accurate information of the enemy's position a day in advance.

The officers of the United States army were the first to experiment with wireless in aeroplanes successfully, but they have been hampered in their work through the lack of aerial craft and funds to perfect the apparatus.

USE OF LIGHT IN MAKING NIGHT EXCAVATIONS

Night excavation work as efficient as that done in daylight is now possible by the use of an electric head-light on derrick-operated bucket outfits. The first really successful test of the scheme was made during the rush work on the Evanston channel of the Chicago Drainage Canal. The light used was of the locomotive head-lamp type, of 3,000 cp. This was backed with an 18-in. reflector, 3 in. deep, which focused the light into a slightly divergent beam directly under the boom from which the bucket was hung. When it was necessary to obtain great diffusion of light, the reflector was put out of focus by advancing the arc a fraction of an inch, projecting the light over a large area. The lamp was



Excavation Bucket Used at Night with the Aid of Electric Light. Photograph Made 150 Ft. from Bucket, During Chicago Drainage Canal Work.

mounted on the turntable of the derrick crane and was rotated with it so that it followed the bucket in all positions.



Making the Four Photographs Simultaneously

PHOTOGRAPHY AN AID TO SCULPTORS

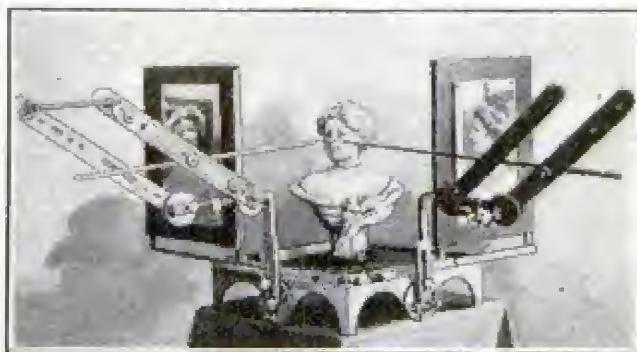
The idea of using photographs to facilitate the work of the sculptor is not new, it being attempted 40 or 50 years ago with 24 cameras placed in a circle. The idea did not then, however, meet with the success expected.

A French sculptor has now devised a simple method by means of which more or less finished working models can be made. By means of four photographs taken simultaneously from all four sides, and a modeling stand of special construction, he can work out the dominant characteristics of face and figure required for the working model. One of the illustrations shows the arrangement of the four cameras, how they may be snapped at the same time, and the weighted strings suspended over the head of the model in order to determine the different planes the photographs represent, giving reference data for the later operations.

The finished photographs are placed

in frames on the modeling stand. This stand has a square metal base, provided in the center with a vertical rod serving as an axis for the sculpture. The four sides of the base have grooves in which the vertical wooden frames for the photographs slide. On two adjacent sides of the stand are fixed jointed arms provided with long, sliding, pointed rods which can be adjusted at different angles.

In using the apparatus, two photographs, one full face and the other in profile, are successively inserted in the frames, and slid in front of the arm supporting the pointed rod. Selecting some point, the nose for instance, the pointed rod is brought in contact with it, the inclination of the rod is fixed by means of a setscrew, and the rod drawn back. The sculptor then repeats this performance with the profile photograph, the photographs are moved to one side, and the rods pushed forward again. Where



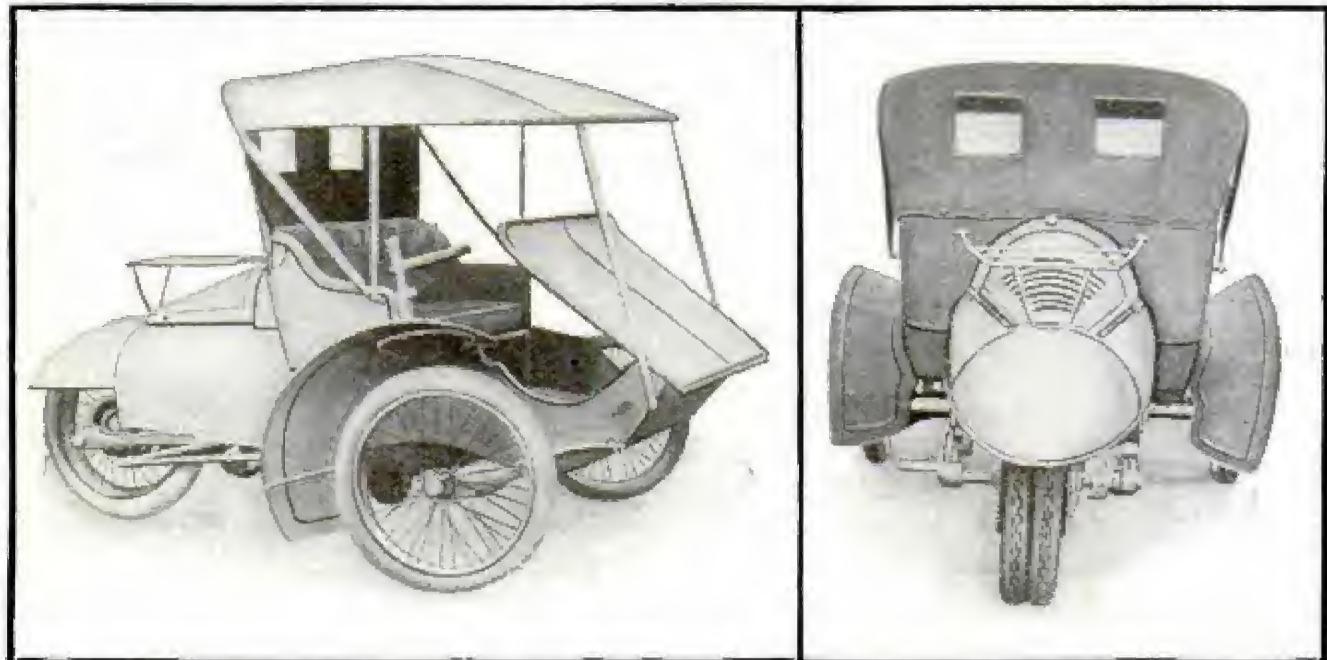
The Modeling Stand

they meet is the point of the nose of the future bust.

The next operation is to surround the vertical rod in the center of the stand with the plastic material and to model the nose to the point indicated, after which the rods are withdrawn, the photographs again swung to the same position as before, and a new point determined and modeled, this operation being repeated until all the points shown by the two photographs are incorporated. Then the same operation is carried out with the two remaining photographs until a model is obtained on which the sculptor needs only to put the finishing touches and impress the personal factor of his talent.

TO RESTRICT CARRYING OF MATCHES

Congress has been asked to enact national legislation to prohibit the transportation of white and yellow phosphorus matches in the United States. These are types of the variety commonly referred to as parlor matches. A penalty of \$1,000 fine and imprisonment for three years, or either, is attached to the proposed law. To prevent any concern from acquiring a monopoly of other processes of making matches, the bill in Congress proposes to give any person the right to manufacture matches, under any patent process, through the medium of a license issued by the judge of a United States circuit court, to whom



Novel Three-Wheeled Motor Car

BRITISH THREE-WHEELED MOTOR CAR

A novel three-wheeled automobile or motorette, with a curiously designed body, is being demonstrated in London. The single rear wheel, which is the drive wheel, carries twin 26-in. tires. The car has a sloping dash and hood, which, when not required, are thrown back out of the way. Behind the seat, the body slopes away to a point and forms the bonnet, which, when removed, gives access to the engine.

Curious Appearance from the Rear

the prospective manufacturer is authorized to apply. The owner of the patent is required by the law proposed to supply licenses to persons thus authorized to use them.

No appreciable wear is noticeable on a stairway in a section of the Paris subway where carborundum crystals were mixed with the concrete of which the stairs were made. More than 14,000,000 people passed up and down the stairs during the time observations were taken.

NEW YORK EXPLOSION NOT DUE TO ACETYLENE

The explosion which occurred at the Grand Central Station, New York, on Dec. 19, killing 10 persons and injuring many others, was not caused by acetylene gas as was stated in reports sent out from New York immediately following the disaster. It is unfortunate that these reports received such credence for, unless contradicted, they tend to cast a shadow on an important and useful industry. It is hoped that the refutation will be as widespread as the original reports. Commercial acetylene is handled in tanks which make explosion impossible, and almost all automobiles have substituted these tanks for the old fashioned wet generators. The coroner's jury which investigated the New York explosion declared that acetylene was not responsible, but that the disaster was due to some other cause.

DEATH SPREAD OVER WIDE RADIUS BY AERO BOMB

Practical experiments in bomb-dropping and scouting with aeroplanes were carried on in connection with the aviation meeting at San Francisco recently. Lieut. M. S. Crissy of the Coast Artillery Corps, as a passenger in Parmalee's Wright machine, dropped a shrapnel shell from a height of 475 ft. Examination of the spot after the explosion of the shell showed it to have a destructive radius of 70 yd. Later on the same day Lieut. John C. Walker, 8th U. S. Infantry, made a flight with Walter Brookins and from an elevation of 1,000 ft. took photographs of the aviation field and army camp connected therewith, which, when developed, showed the camp and its surroundings in a manner that would have been valuable in time of war.

Captain Bellanger of the French army aerial corps has established a new speed record by flying a distance of 100 miles across country in 70 min.



THE FALL THAT KILLED HOXSEY

When Arch. Hoxsey was killed at Los Angeles his plunge was in plain sight of thousands of spectators. The machine came down at incredible speed.



Panoramic View Showing Progress of Work of Raising

RAISING THE "MAINE"

By COLONEL WILLIAM M. BLACK

*Corps of Engineers, United States Army—In charge of Salvage Operations
on Historic Battleship in Havana Harbor*

DELVING below the ocean floor in the harbor of Havana scores of busy workmen are unmasking the hulk of the battleship "Maine" at the behest of the American people that they may learn from the bones of the ship the secret of its dissolution 13 years ago. Since the evening of Feb. 15, 1898, the metal mast and twisted iron and steel that a terrific explosion forced over the superstructure have formed the most conspicuous objects in the water roadway to the Cuban capital. For more than 12 years the American people have permitted the ship and the dead within her to lie at the harbor bottom. Appeals to Congress met response last summer in an appropriation placed at the disposal of the Secretary of War for the raising of the ship. With the Chief of Engineers of the Army he was directed to use all dispatch in beginning operations to the end that the bodies remaining in the hulk might be properly interred at the Arlington National Cemetery, that the mast might be re-erected over the

graves of the men who lost their lives, and that a final and complete examination of the wreck might be made to determine definitely the nature of the explosion.

A board of three engineer officers, Col. W. M. Black, Lieut.-Col. M. M. Patrick and Capt. Harley B. Ferguson, was appointed to carry out the will of Congress. In preparing plans for the work, the board had in mind the various considerations expressed in the speeches in Congress and upon which action by that body was taken.

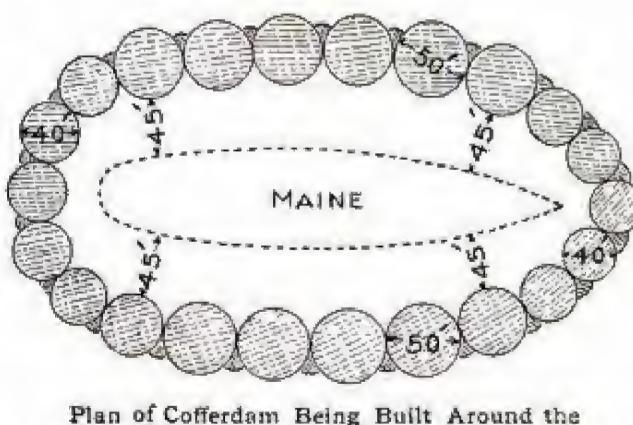
From the nature of the case any conclusions reached as to the cause of the explosion, based on an examination of the ship, must probably be derived from the positions in which the plates and beams now lie in the wreck, and the direction in which each is bent. To obtain this evidence, and to have it convincing when found, it is necessary that the examination of the broken parts be made as they lie, without a change or a possibility of a change due to the prior operations.



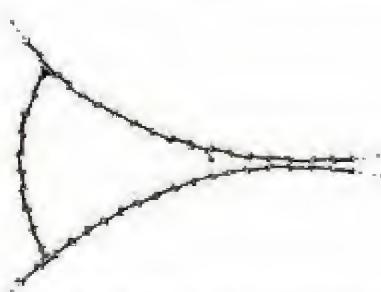
"Maine," and Two of Cylinders in Course of Construction

The forward part of the hull is known to be badly shattered and the metal has been subject to corrosion for more than 12 years. It is evident then that the hull must not be touched before the examination, and therefore, that the only possible course to follow is to build a cofferdam around the wreck, remove the water within the dam, and expose the broken parts.

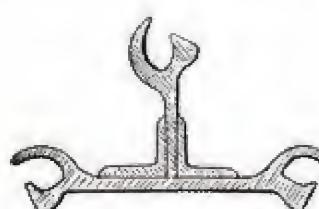
The inner part of Havana Harbor is sheltered from the sea, and the strongest winds do not cause waves of more than 2 ft. in height. The mean range of tide is about 1 ft. and the



Plan of Cofferdam Being Built Around the Sunken Ship

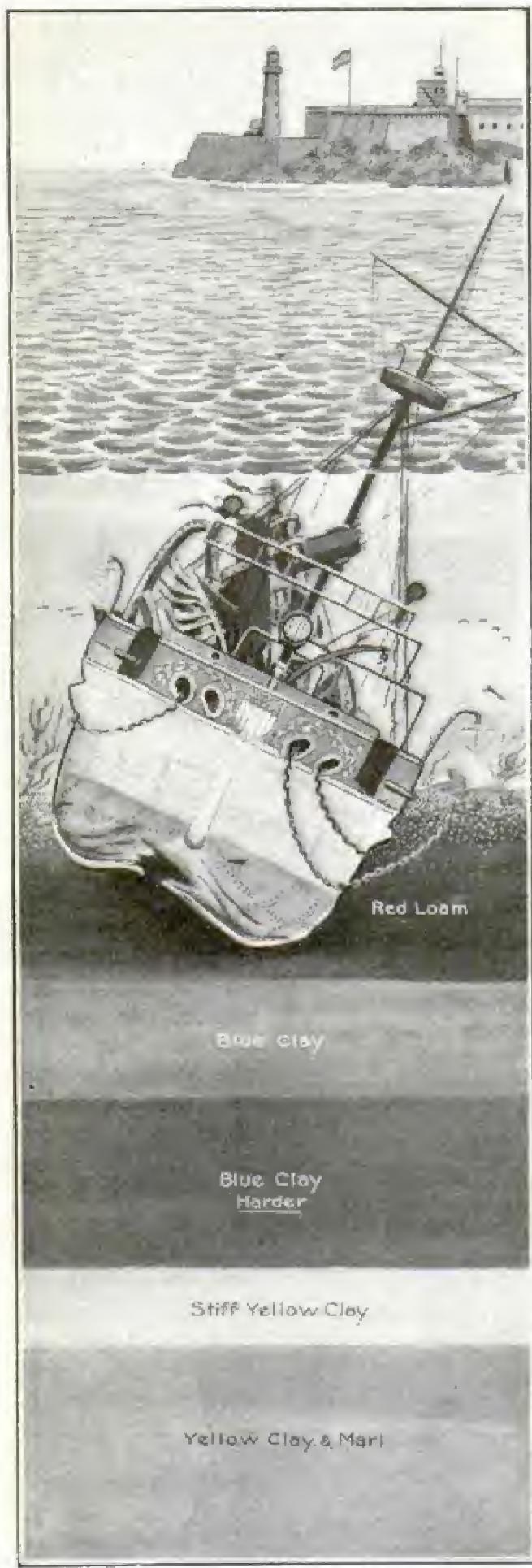


How Separate Steel Piles Are Connected to Form Strengthening Arcs



And Special Plate Made to Form Junction Between Cylinders and Arcs

extreme observed range but slightly over 2 ft. The wreck lies in from 30 to 37 ft. of water, and a comparison of harbor charts shows that the presence of the wreck has caused no appreciable change in the harbor bottom in her vicinity. Borings around the wreck show that rock is found at a depth of about 100 ft. and that this is overlaid with clay. For the upper 18 ft. this clay is reddish in color, contains an admixture of coral sand, and is soft. At a depth of 55 ft. blue clay is found, gradually increasing in stiffness with increasing



Sectional View Showing Strata under Havana Harbor and Position of "Maine" in Red Loam

depth. Earlier work in the harbor has shown that heavy objects, such as chains, anchors, etc., dropped on the bottom sank in the mud to a depth of from 8 to 10 ft. but failed to move further.

Rough observations made in the after part of the wreck of the "Maine" showed that at the stern, the keel lies at about that depth in the mud, and that there has been but little or no downward movement since the ship sank.

The cofferdam to be used will enclose the area occupied by the hull and the attached wreckage, with sufficient space in addition to admit of the construction which may be required to insure the stability of the wreck during the examination, and to remove it later. It is being so made as to be easily removable, and, if practicable, with such salvage as would make a partial return of the money expended for its construction.

Many types of dams were investigated. It was found that a cofferdam of interlocking steel sheet piling, with the clay of the harbor bottom for filling, best fulfilled the conditions, and that the full strength of the piling could be best utilized by making the dam of a series of cylinders. These cylinders are being placed tangent to each other around the periphery of an ellipse of sufficient size—each cylinder having stability sufficient to enable it to resist the pressure of the mud and water from the outside independently.

Calculations showed that under the most severe assumptions, a cylinder 50 ft. in diameter, with the piles driven to a depth of 70 ft. below the surface and filled with the harbor clay, would have the requisite stability. The cofferdam now being constructed thus is of elliptical form and is made up of 20 cylinders, each 50 ft. in diameter, set tangent to each other. The major and minor axes of the ellipse drawn through the center are 409 ft. and 220 ft. long, respectively, and the clear space between the wreck and the dam has a width of 20 ft. at the bow, 14 ft. at the stern, and 55 ft. amidships on both



As the Mast of the "Maine" Will Appear When Placed in Arlington Cemetery, Marking the Graves of Sailors That Lost Their Lives in the Explosion



One of the Sheet Piling Cylinders being Placed around the Hulk of the "Maine." The Wreck in Rear

sides. To make the cylinders stable and the dam watertight, short arcs of circles formed of the same sheet piling connect adjacent cylinders around the outside, between "three-way piece"

piles set in each cylinder. The cylinders and the sectors around the outside are to be filled with clay dredged from the harbor bottom.

The Cuban government is assisting

the United States in this work most cordially. A wharf of sufficient size, conveniently located in Casa Blanca, just beneath the walls of the Cabaña Fortress, has been set aside for the work. To place the cylinders, ordinary round piles are driven at the axis of each. Around this central pile is floated a templet of wood, made in sections for ease of removal. The sheet piles are shipped in lengths of 25, 35, 40 and 50 ft. and are bored and provided with fish plates and bolts for assembling into lengths of 75 ft. The piles for a complete cylinder are set

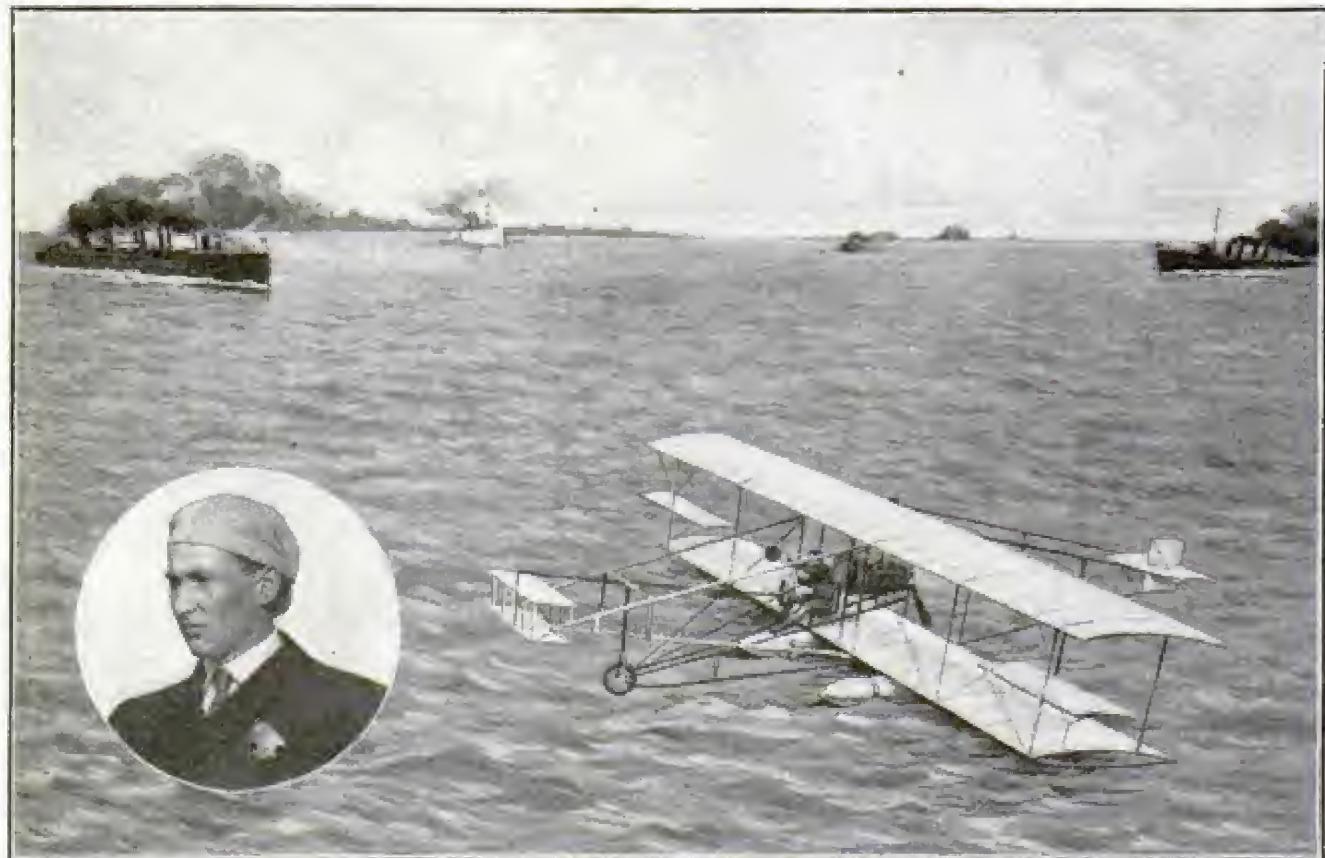
up around a templet and then driven to the required depth.

After any remains of the dead found in the wreck have been removed and the necessary examination has been made, the actual removal of the wreck will be begun by whatever method is found most economical and advantageous. It now seems probable that this will be to sever the shattered portion of the hull from the after part; to build a bulkhead across the cut section; to remove the shattered parts piece-meal and finally to float the unbroken end away from Havana.

McCURDY MAKES RECORD OVERSEA FLIGHT

A leak in the lubricating mechanism of his Curtiss biplane marred the attempted oversea flight of J. A. D. McCurdy from Key West, Florida, to Havana, Cuba, on Jan. 30. After beating the world's record for flying over the ocean and making 96 miles at the rate of 50 miles an hour, McCurdy was forced to descend into the sea within 10 miles of Havana.

The course between Key West and Havana was marked by vessels of the Atlantic torpedo boat flotilla which were stationed at intervals 10 miles apart for the entire distance. The weather was ideal for the attempt, there being no wind. He was within sight of his goal when he noticed that the oil had been exhausted through leakage and that the engine was showing the



J. A. D. McCurdy in His Biplane Alighting on the Water 10 Miles from Havana, Torpedo Boats Coming to His Rescue

effects of lack of lubricant. He stopped the engine and descended immediately. His machine was equipped with pontoons and rested lightly on the surface of the water, there being no sea running. The torpedo boats "Terry" and "Paulding," the latter being the last in the line of boats, hurried to his assistance. He was about equidistant from both when he came down. McCurdy and his machine were placed aboard the boats, the "Terry" taking the machine and the "Paulding" the airman into Havana. The prize of \$8,000 was awarded him on the ground that the airman had practically accomplished his task and established a new record for flying over sea, the English channel flights being about one-sixth the length of the Key West-Havana course.

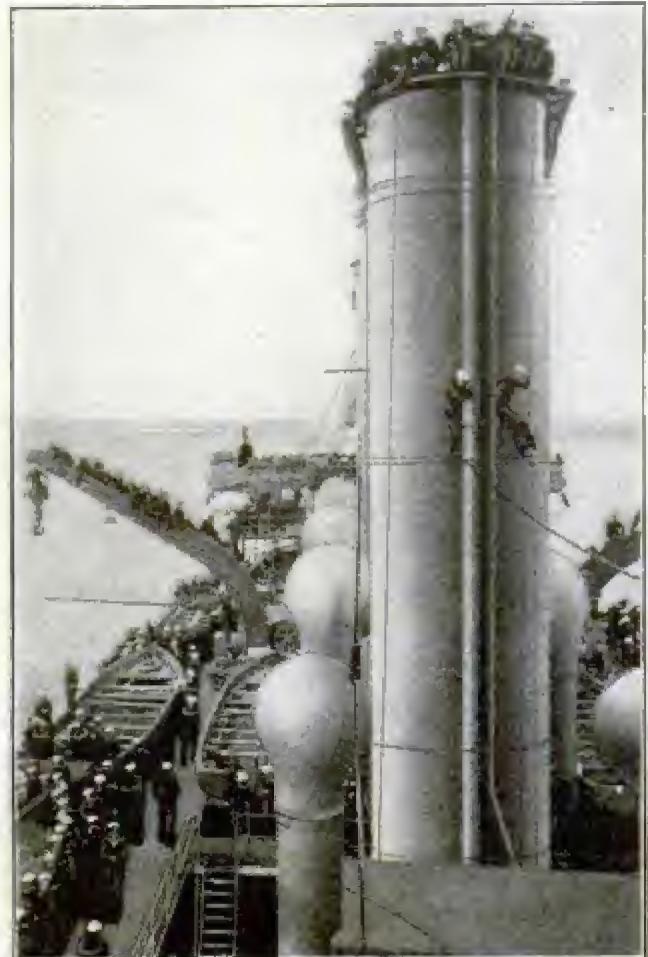
SUCCESSFUL RESCUE OF SUNKEN SUBMARINE

A submarine telephone set and the German rescue ship "Vulcan" proved the efficiency of such emergency apparatus when the German submarine "U.3" sank in the harbor at Kiel. As soon as the accident occurred, the crew of the submarine released a spherical buoy containing telephone apparatus, which shot to the surface, uncoiling the wires as it rose. By means of this telephone the exact position of the submarine and the conditions within it were communicated to the surface, and the "Vulcan" immediately ordered to the scene. The bow of the submarine was lifted sufficiently for the 30 members of the crew to escape through the torpedo discharge tube. Only 27 men left the vessel, however, the captain and his two lieutenants deciding to remain in the conning tower until the vessel was again master of itself, a decision which resulted in their death. The conning tower was still under water, the vessel not yet having been fully raised when a ventilator gave way, permitting the water to rush in, isolating the tower and cutting off the oxygen upon which the three officers were dependent.



AEROPLANE PROVES ITSELF A NAVAL AID

The aviation experts of the naval service believe that by the remarkable performances of Glenn Curtiss and Eugene B. Ely in California, during the latter part of January, they have successfully refuted the criticisms of



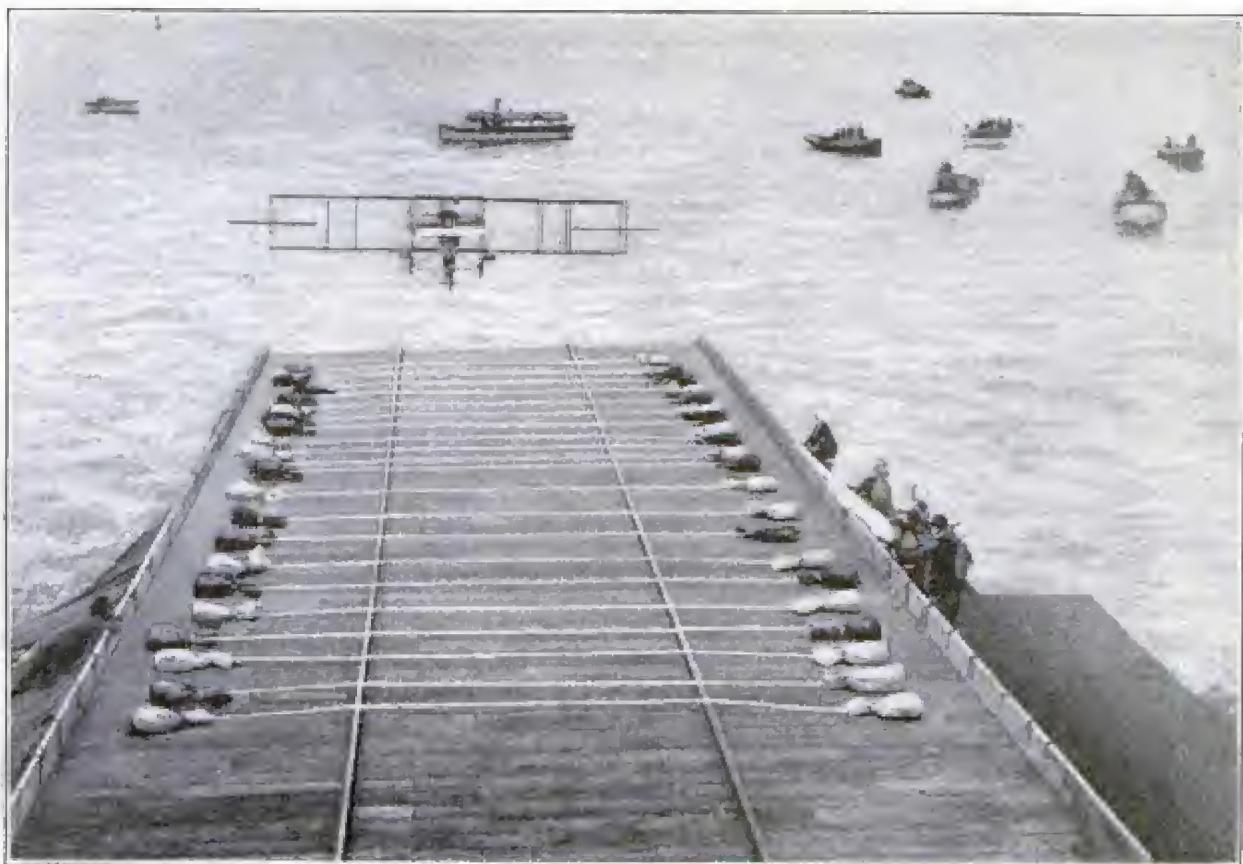
Crew of "Pennsylvania" Climbed Even to the Tops of the Funnel to Witness Ely's Feat

those who have failed to see the adaptability of the aeroplane in naval warfare. With a Curtiss type of biplane, Ely flew from the shore to the deck of the armored cruiser "Pennsylvania," in San Francisco Bay, where he alighted without accident and then flew from the ship to the shore. Curtiss, with his hydroplane attachment, after several trials, succeeded in ascending in his machine from the surface of the water, returning to the water, and rising again into the air.

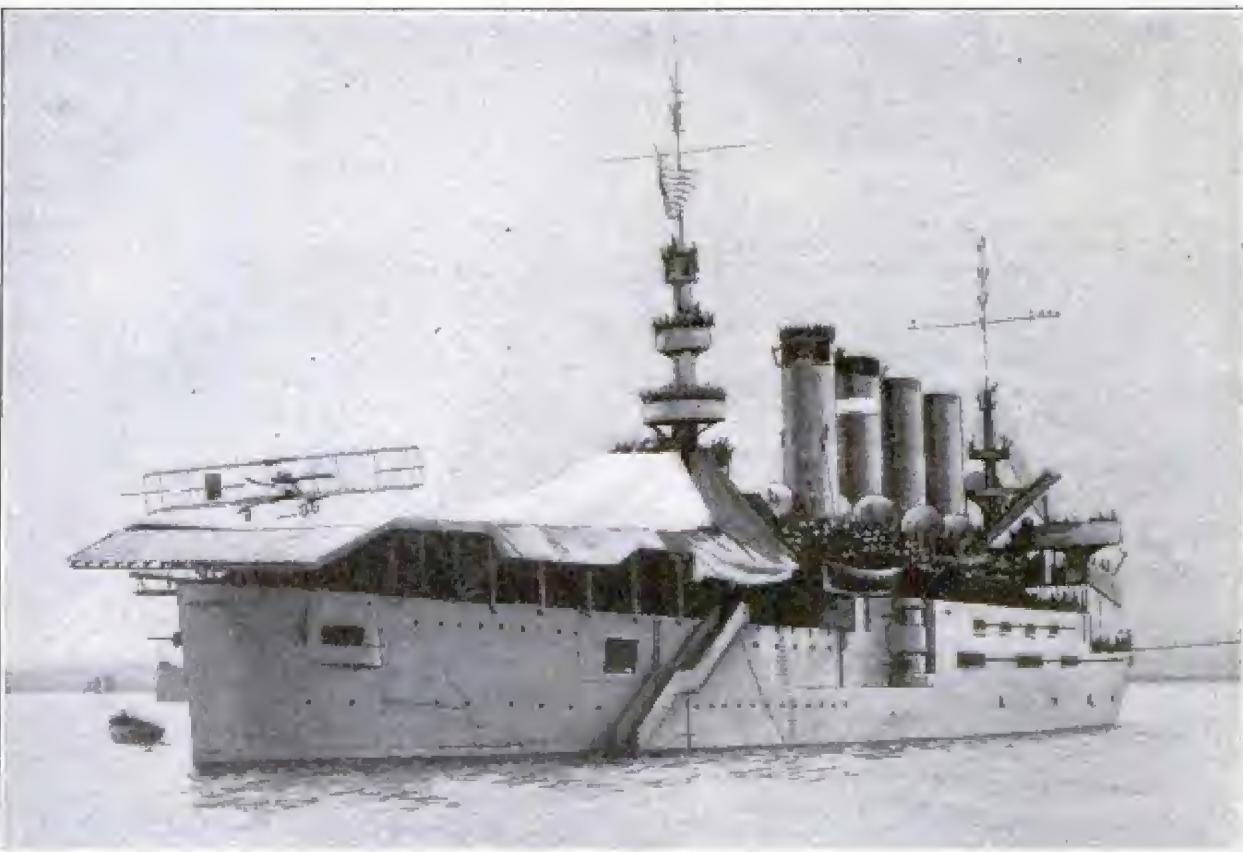
There has always been a question as to the ability of the airman to return to the deck of a warship after once going into the air. If it was found he

could not do so, then, the value of the aeroplane to the battle fleet commander was very slight. The thing was done under ideal conditions with ease and all risk to the machine and the operator was reduced to a minimum. A platform, 130 ft. long and 50 ft. wide, was constructed on the after deck of the "Pennsylvania." Across this platform were stretched pieces of rope a foot or two apart, to either end of which were attached bags filled with 100 lb. of sand. The under part of the running gear of the aeroplane was fitted with hooks, the idea being that the hooks would engage the ropes as the machine was guided along the platform, and the weight pulling against the machine would gradually bring it to a stop without straining the frame. This theory worked perfectly in practice. Ely lowered the machine to the platform so that it glided onto the platform about 40 ft. from the end. It was moving rapidly when it alighted on the ship but was stopped within 25 ft. by the gradually accumulating weight of the sand bags. The launching of the machine was accomplished in the same manner as the launching from the deck of the scout cruiser "Birmingham" in Hampton Roads.

The Curtiss hydroplane tests took place at San Diego and were the result of a series of experiments Curtiss began more than a year ago. The aeroplane in this instance was equipped with pontoons instead of runners. The machine was run on the water for a short distance at a high rate of speed before being directed into the air. The tests were highly successful and demonstrated the ability of such a machine to be launched from the sea itself. In both these tests the airmen waited several days for the most favorable moment for their work. Whether the feats can be accomplished under the average conditions of weather and sea remains to be demonstrated and on this depends the practical value of heavier-than-air machines in naval warfare.



Platform Built on the Deck of the Armored Cruiser "Pennsylvania" to Receive Ely's Aeroplane. Note the Ropes Stretched Across the Platform with Sand Bags at Either End Which Hooks on the Aeroplane Picked Up, the Gradually Increasing Weight Bringing the Machine to a Stop within 25 Feet.

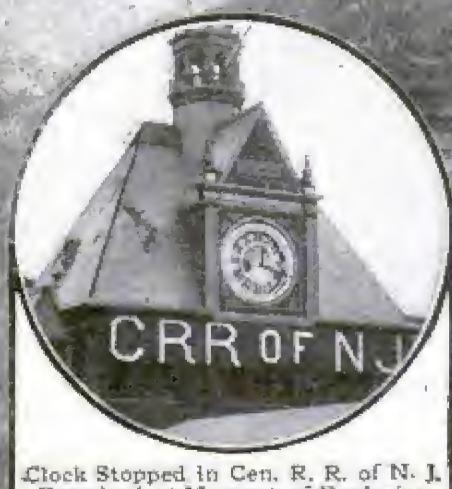


Eugene B. Ely Alighting on the Deck of the Armored Cruiser "Pennsylvania" in San Francisco Bay, January 18. The Photograph Was Made Just As the Aeroplane Started to Drop to the Deck. The Machine Was Launched from This Platform on the Return Trip to the Aviation Field.



View of the Wrecked Pier and Cars—Note Damage on Opposite Sheds

Explosion Causes \$1,000,000 Damage



Clock Stopped in Cen. R. R. of N. J. Terminal at Moment of Explosion

Captain of Tugboat Half-Mile away KILLED

Hudson Terminal Damaged
All Windows Broken
Structure Severely Shaken

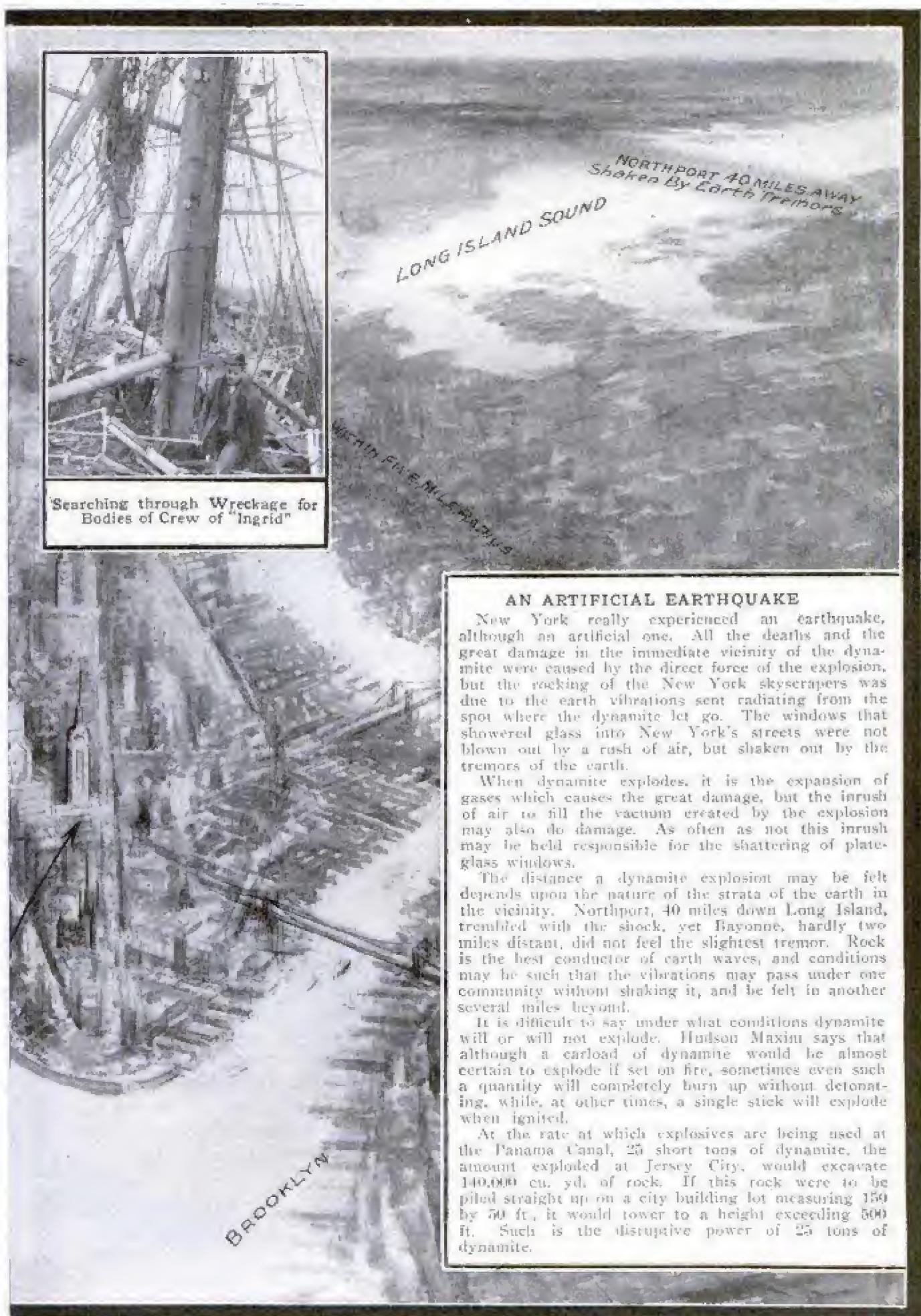
Sheds Wrecked

Dotted Outlines Show Positions
of Two Dynamite Lighters
Used before Explosion—
They were Blown to Pieces

Dynamited Pier

Lower New York Skyscrapers
Trembled—People Panic Stricken
\$50,000 Loss in Plate Glass

Steel Barkentine "Ingrid"
Members of Crew KILLED
Ship Stripped of Rigging



AN ARTIFICIAL EARTHQUAKE

New York really experienced an earthquake, although an artificial one. All the deaths and the great damage in the immediate vicinity of the dynamite were caused by the direct force of the explosion, but the rocking of the New York skyscrapers was due to the earth vibrations sent radiating from the spot where the dynamite let go. The windows that showered glass into New York's streets were not blown out by a rush of air, but shaken out by the tremors of the earth.

When dynamite explodes, it is the expansion of gases which causes the great damage, but the inrush of air to fill the vacuum created by the explosion may also do damage. As often as not this inrush may be held responsible for the shattering of plate-glass windows.

The distance a dynamite explosion may be felt depends upon the nature of the strata of the earth in the vicinity. Northport, 40 miles down Long Island, trembled with the shock, yet Bayonne, hardly two miles distant, did not feel the slightest tremor. Rock is the best conductor of earth waves, and conditions may be such that the vibrations may pass under one community without shaking it, and be felt in another several miles beyond.

It is difficult to say under what conditions dynamite will or will not explode. Hudson Maxim says that although a carload of dynamite would be almost certain to explode if set on fire, sometimes even such a quantity will completely burn up without detonating, while, at other times, a single stick will explode when ignited.

At the rate at which explosives are being used at the Panama Canal, 25 short tons of dynamite, the amount exploded at Jersey City, would excavate 140,000 cu. yds. of rock. If this rock were to be piled straight up on a city building lot measuring 150 by 50 ft., it would tower to a height exceeding 500 ft. Such is the disruptive power of 25 tons of dynamite.

COMMENT AND REVIEW

MUCKRAKING has had a rude awakening. The law, which it so loudly called down upon a big corporation, has at last been invoked by the victim and the accusing magazine loses no time in begging for mercy, and pleading to be let off with a retraction. After all the abuse, vilification, and certainly no small amount of falsehood which magazine writers and publishers have for several years heaped upon the Standard Oil Company, that corporation would have been amply justified in pushing its suit, even with the full knowledge that to do so might mean confiscation of the magazine. Perhaps the lesson will be taken to heart by other muckrakers whom immunity thus far has emboldened to write, regardless of all sense of fairness and frequently of fact. Have you ever considered the why of the muckraker? It seems to me like this:

When Rome was fighting its wars of conquest, building its empire and framing its wonderful code of laws, the minds of the people were occupied in the doing of real things. Then the people profited by public contests of strength and skill, and physical manhood was glorified. But later on, with surrounding nations subjected, and surfeited with conquest, the appetite for blood led to the institution of those revolting dramas where blindfolded gladiators fought to the death, and helpless maidens were fed alive to wild beasts, or served as living torches. All these for the entertainment of the masses. It was a legalized concession to a perverted public taste, as ignoble, beastly and degenerating as it was cruel and wicked.

For the past fifteen years we have had what is known as yellow journalism. For a time this was confined to the daily press. A depraved public appetite for the sensational was thus created and nurtured. The simple, straightforward, accurate telling of an event ceased to satisfy. A perverted taste demanded a highly flavored and sensational style in which extravagant statement, suspicion, accusation and innuendo were employed to make a startling condition, quite regardless of truth or of what the effect might be on the innocent subject of the attack.

The magazine disease started with Lawson's "Frenzied Finance," which, while paying off some old personal scores, nevertheless resulted in enormous good. The financial success which accrued to its publisher made other publishers jealous and eager, but what began with an ostensible effort to right real wrongs speedily degenerated into a wild scramble after imaginary evils. The extent to which this was carried is fairly illustrated in the case of an honored man now on the Supreme Bench of the United States, who was ridiculed and impugned because he was an attendant upon a Sunday school! Facts only half stated, or expressed in language which made white appear black, suggestions conveying an impression directly opposite to the truth became a fine art with the muckraker.

In the mad rush for circulation in order to command a large volume of advertising at high rates, many of the magazines put the yellow slide in their spot light. Some things were exposed which doubtless needed publicity, but in doing it the temptation could not be resisted to paint the picture in vivid colors, and as competition rapidly developed, publishers became more and more insistent for

The Penalty of Muckraking

"hot stuff" in an effort to outdo their competitors and satisfy a growing but wholly abnormal appetite for sensationalism. Soon the fairly moderate style of these articles began to fall flat on an unnatural mental taste, and publishers demanded of the writers more highly seasoned and sensational stories in order to keep up the pace, and eventually the moderate and possibly well meant and honest effort to correct existing wrongs—some of which are admitted—was entirely lost sight of in the mad race to see who could put out yellow magazinism in the ultimate. Thus degenerated the standard of so many of our monthlies. Then what happened?

As Rome came at last to weary of the weekly public murders through mere monotony of repetition, so the American public at last grew tired of mudslinging because of its commonness. They were surfeited. Their mental digestion was impaired; the food no longer produced the healthy red corpuscles which gave strength to mind and imagination. Their brain cells were clogged with poisonous matter; the whole mental system was run down. It became a case of "the day after" with an unwholesome, dark brown taste in the mouth. The substantial, sanely entertaining, instructive, beautiful and healthful articles of fiction, travel, biography and the like, seemed tame after the long mental debauch. And today both publisher and reader of the yellow magazines are wondering, the one why his sales are falling off, and the other why the magazine is no longer so interesting as it used to be. Yellow leaves fall from withered branches.

Another phase of this back-firing of the engine is seen in the frenzied, artificial methods to hold and bolster up circulation by means of premiums to secure subscribers, and in the cut rates where a combination of publishers offer a group of magazines at half, or less, the regular advertised price. On top of this, a further big reduction to subscription agencies through which the cut rates are handled, has cut down the net price to the publisher, until in some cases he is receiving less than one-third his subscription price, or about one-half the cost of the white paper alone. The magazines which today are making any money on their circulation can be counted, doubtless, on the fingers of one hand. Who pays the freight did you say? The advertiser. This method of keeping the patient alive with oxygen or injections of nitro-glycerine must soon fail for reasons which are self-evident. But we digress.

Muckraking has had its fling; it has seen its balmy days, and now must come the sobering up, and nursing back to health of vitiated mental appetites. The eyes of the readers have been color blinded until everything looks yellow, or if seen in any other hue, appears unnatural. It will take time, yet it will come, but in the process of recuperation some magazines, the worst offenders, are sure to pay the penalty of excesses: Some will struggle through to health again, and some whose vitality is at low ebb will not survive, but out of it will come a chastened, enlightened class of publishers and a return to that high standard of real literature which only a few magazines have steadily maintained through these weary years of husk eating and reveling with the swine.

H. H. WINDSOR.

FITTING A PROPELLER AT SEA

The steamship "Taiwan" was recently refitted with a new propeller in an open roadstead by loading down the bow of the ship with over 1,200 tons of ballast so as to raise up the



Steamer Fitted with New Propeller in Open Roadstead

stern tube clear out of the water. The vessel, which is 271.3 ft. long and has a gross tonnage of 1,743 tons, lost her propeller in mid-ocean when on a voyage from Mauritius to Hong-kong. She was sailed some 600 miles to Mahé Island in the Seychelles, and as no dock was available, she had to be tipped in the manner stated while the broken end of the propeller shaft was pushed out through the stern tube, a new shaft inserted, and a new propeller put on and fixed.

The illustration shows the ship with her stern out of the water and the repair work practically completed.

A mouse caught in the generator switches of a Delaware electric lighting plant, caused a short circuit which cut off the current, and consequently the light, from three cities.

A special train carrying J. Pierpont Morgan and party from Washington to New York made the record time of 3 hours and 56 minutes for the trip which usually takes 6 hours.

MME. CURIE REJECTED FOR COHERER INVENTOR

Mme. Marie Curie, who is given equal credit with her husband for the discovery of radium, has been defeated for admission to membership of the French Academy of Sciences by M.

Edouard Branly, the inventor of the coherer for wireless telegraphy. The vote, taken Jan. 23, stood 28 for Mme. Curie to 30 for M. Branly. The woman scientist's name headed the list of six candidates that was presented, only one of which was to be chosen.

The Branly coherer was so important a factor in the development and perfection of the wireless telegraph apparatus that Marconi selected him as the man to whom he sent

the first message by wireless from England to France. The announcement was made after the vote had been taken that the vote did not reflect the attitude of the academy toward the admission of women in any sense, and that the election was based solely on the merits of the claims of the two candidates for recognition by the foremost body of scientists in France.

55-STORY SKYSCRAPER FOR NEW YORK

Enlarged plans for the proposed Woolworth Building in lower New York provide for a structure 750 ft. high, 50 ft. higher than the Metropolitan Tower. The main building will have 30 stories and above this will rise a tower about 80 to 85 ft. square, containing about 25 stories, making 55 in all. This skyscraper will be exceeded in height only by the Eiffel Tower which is 985 ft. high, and will cost \$12,000,000. It will cover a total area of 39,500 sq. ft. The original plans provided for a structure 625 ft. high.

ELECTRICAL MAGIC SURPASSES LEGERDEMAIN



Frying an Egg on Ice



Lighting a Lamp by Wireless

Can eggs be fried on ice? Is it possible to take an ordinary frying pan, hold it over a cake of ice, break an egg into it and fry the egg to a turn without a fire, simply holding the pan in the hand?

It can be done. This and other spectacular tricks of a similar nature were performed at a recent electrical show in Chicago. Many skeptics lost their money betting against it. They felt the cold pan, broke the egg into it, held the pan over the ice themselves, and then burnt their fingers while the egg was frying to find out if the pan was really hot.

An oven of slate with an aluminum base was placed on the marble slab forming the top of the table whereon the ice had reposed for the previous experiment. It was just a simple oven, no fire, no coils, no wires, only slate and aluminum. In the oven were placed the lumps of dough for making biscuits. The oven door was closed and the operator stood, watch in hand, checking off the minutes. Presently he opened the door, and there were the



Lighting the Lamp Through the Hands—The Base is Simply a Coil of Wire

THREE STARTLING EXPERIMENTS

biscuits, baked to a n appetizing light brown.

A tungsten lamp, screwed into a socket attached to a simple coil of wire, was placed with the coil immersed in an iron pan partly filled with water. It was set on a slate slab which was placed on the table. Immediately the lamp lighted. A spectator suggested that there was

some mystery connected with the pan. He was invited to place his hands palms downward on the slate. He did so, and the coil, with the lamp attached, was placed on the backs of his hands. The lamp immediately began to glow.

A hollow copper ball, floating in a jar of water, whirled around furiously when the jar was stood on the table. A simple apparatus, consisting of a frame and four pivoted aluminum disks, was put on the slab. The disks whizzed around at a tremendous rate.

Two plates, one a heavy disk of metal and the other a tin dinner plate, were put on the table. The table did not move a bit, but the plates sprang

several feet in the air and dropped on the floor.

It all was done by wireless. Under the table was a powerful electromagnet. When the operator turned on the electric current, which was the ordinary alternating current from the

city mains, a powerful alternating magnetic field permeated everything in the vicinity. In any metal part nearby, it set up induced electric currents, which caused the performances. There was no trickery. Any electrical enthusiast can do the same things.

WRECKED EXPLORERS WALK 1,100 MILES

A scientific expedition, consisting of 14 men, headed by Prof. J. I. MacConn, of the Canadian geological survey, arrived safely at Winnipeg, Manitoba, the latter part of January after a journey on foot of 1,100 miles in a temperature averaging 60 deg. below zero. Their vessel, the Arctic schooner "Jeanne," in command of Capt. Howard Bartlett, was driven ashore and pounded to pieces in the northwest region of Hudson Bay, and the expedition landed safely, although both lifeboats were smashed. With the aid of Eskimos the expedition tramped 100 miles to Fullerton. Then the party journeyed to Fort Churchill, 500 miles south, on a whaling vessel, where clothing and provisions were obtained. The long march from Fort Churchill to Gimli was started on Dec. 8, with Indians as guides. That no lives were lost on the long tramp is regarded as a great achievement.

MOTOR AND PROPELLER TO GIVE STABILITY

M. Bouchaud-Praceiq, a French chemical engineer, claims to have discovered the solution of automatic stability for aeroplanes. It is simply this: Make the motor revolve in a direction opposite to that of the propeller, and if the gyroscopic effects of the oppositely revolving masses are equal, the result will, it is said, be perfect automatic stability.

The experiments were made with a motor-driven propeller apparatus supported on a board which was suspended by strings.

The Ligez motor, which was recently demonstrated with success at Issy-les-Moulineaux, acts on a similar principle, and the aeroplane to which it was fitted was enabled to perform with apparently perfect safety some extraordinary evolutions in the air.

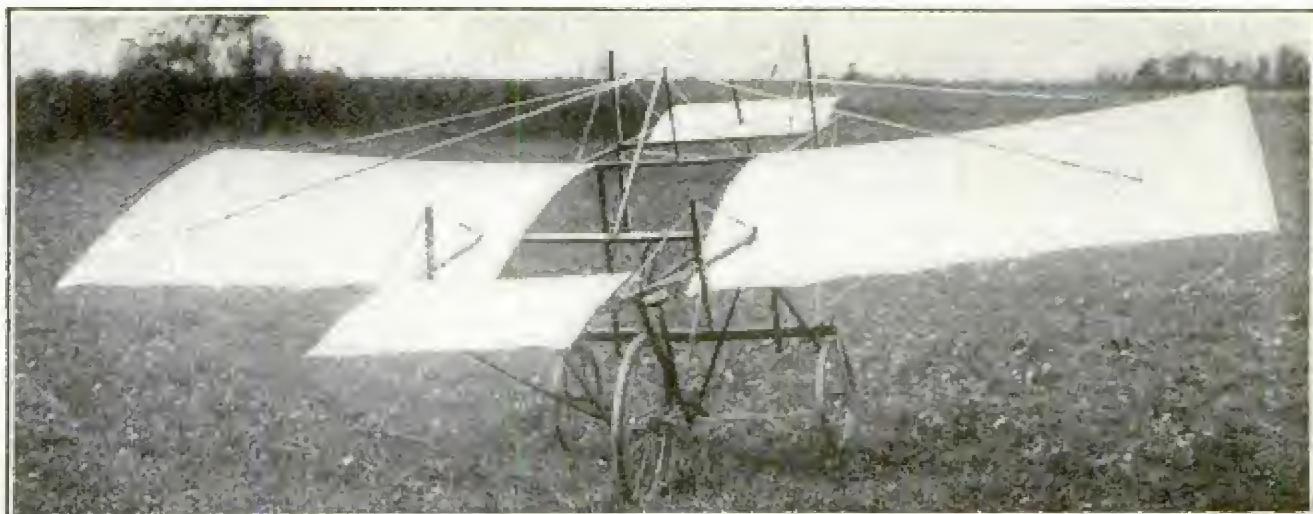
GERMAN AERONAUTS LOSE THEIR LIVES

Sixteen days after its disappearance after an ascent from Schmargendorf, the German balloon "Hildebrandt" was found in a lake in Pomerania province, Prussia, with the bodies of Dr. Roehrs, the pilot, and a companion. The balloon ascended Dec. 29, equipped for a 48-hr. voyage. Nothing was heard from it and it was supposed to have been lost in the Baltic, as an airship resembling it was reported to have been sighted passing over Höganäs, Sweden, on the evening of Jan. 4. The remains of the aeronauts were discovered in the car of the balloon when the balloon was found in Pomerania.

CITY HELD RESPONSIBLE FOR TYPHOID

Although the relations of a city to its citizens are such that damages resulting from the construction and operation of public works cannot ordinarily be obtained, the supreme court of Minnesota has laid responsibility for typhoid deaths upon the city authorities of Mankato.

The complainant charged the city with negligently allowing its water supply to become polluted with sewage. The court ruled that the municipality was liable in its private or corporate capacity for this negligence.



Rear View of Successful Glider of Original Design Built by Two 16-Year-Old Boys

OIL CONCRETE, THE LATEST IN ROAD MAKING

The latest material in road construction is "oil concrete," which has been used to a depth of 5 in. over a telford foundation on a short experimental road near Harrisburg, Pa. The concrete takes its name from the fact that 15 per cent of oil is added to the ordinary concrete which is used for the upper layer. A thin coating of finely crushed stone was used as a top dressing, and the road was sprinkled daily with water for seven days before it was opened to traffic.

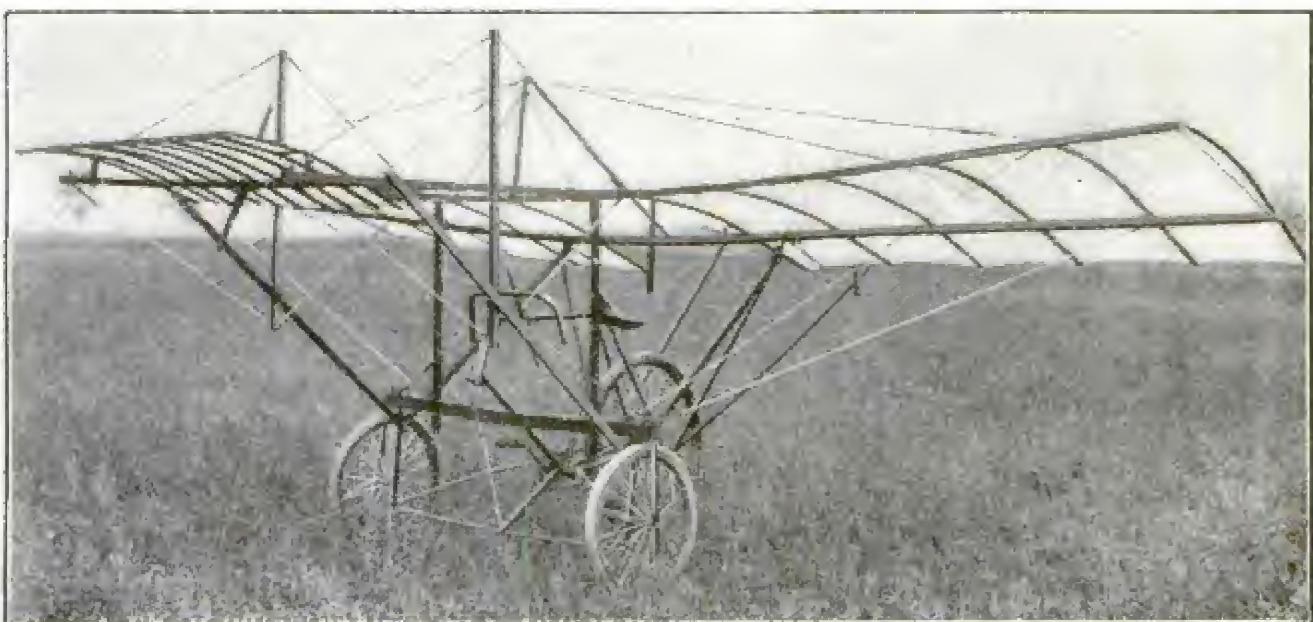
A new foot-warmer for motorists utilizes the heat of both the exhaust gases and the circulation water.

BOYS FLY 250 FEET WITH A HOME-MADE GLIDER

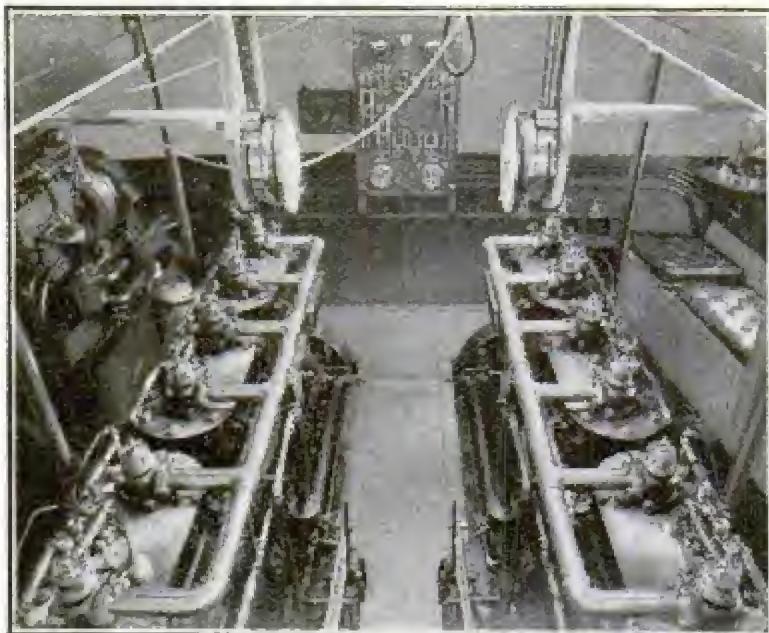
Flying 250 ft. from a 28-ft. embankment in a glider of their own make is the feat recently accomplished by James M. Fitzwilliams and Edgar A. Clark, two 16-years-old boys of Buffalo, N. Y.

The machine is the result of much experimentation and study, and was built only after several smaller models had been made and tried out.

The glider weighs about 55 lb., and the wings, which are curved and slant upward a little from the center to the tip, measure 16 ft. by 4 ft. 8 in. A rear plane or tail is intended to steady the machine in flight and to do the lateral steering.



The Boys Flew 250 Ft. with This Machine after Pedaling It along the Ground



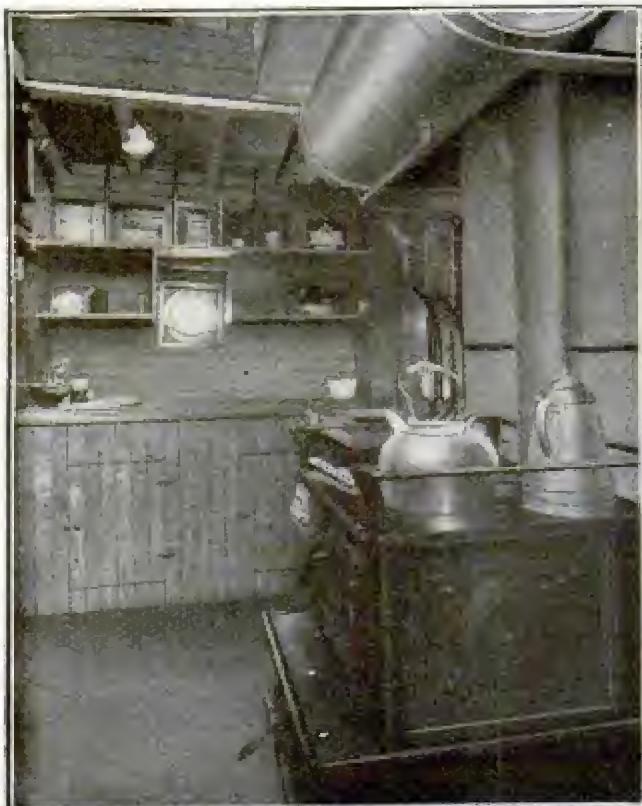
Twin 75-Hp. Engines

Probably more interest was evinced in the building of the twin-screw motorboats "Ethel May II" and "Paula" than in any other orders placed by New Yorkers last year. The two pleasure vessels are "sisters," with the exception that the "Ethel May II" was subsequently equipped with bulwarks, and are owned by Albert E. Smith and J. Stuart Blackton.

The requirements of the owners

TWO REMARKABLE 98-FOOT MOTORBOATS

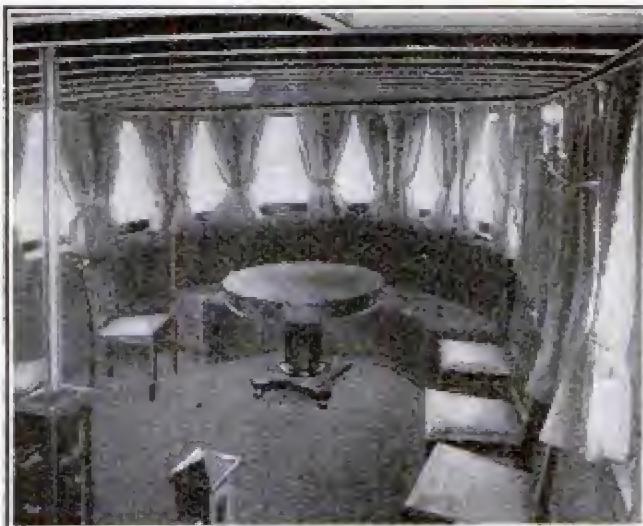
were that the boats should be of flush-deck type, 98 ft. long overall, with a beam of 16 ft., a draft of 4½ ft., full headroom below deck, and an overall height from waterline to top of cabin-house that would be well within the clearances required for the Erie Canal. These specifications enable the boats to make the inland-waterway trip from New York to the St. Lawrence River and the Great Lakes.



Galley Equipped with Coal Range



Owner's Bathroom



Dining Saloon above Deck



One Side of Owner's Stateroom

The motor equipment of each vessel consists of two 75-hp., six-cylinder engines. The exhaust is carried out to the side, and the stack is used as a ventilator for the engine room.

The design of the boats being the same, the description of the accommodations of one suffices for the other. The owner's quarters are located aft of the engine room and are 14 ft. wide, the full inside width of the boat, with a fore-and-aft measurement of 11 ft. In these quarters are two single brass bedsteads, two chiffoniers, two large hanging lockers and, on the port side forward, a large bathroom with porcelain tub, lavatory, etc. Hot and cold water are available throughout, flowing by gravity to all basins and to the bathtub. The fresh water is carried

in tanks of 600-gal. capacity, located under the cabin floor, from which it is pumped by electricity to an auxiliary tank on the cabin roof. The bathtub is emptied by means of an electric pump, and connection to the sea is made so that, by simply pressing an electric button, salt water may be obtained for the bath, if desired.

The main saloon, aft of the owner's quarters, is finished in dark mahogany and is the full width of the vessel. The stationary furniture consists of a desk and bookcase, mantelpiece and lockers, all of mahogany.

Aft of the main saloon are three single staterooms, provided with single berths, lockers and drawers, and full-length dressers and bureaus. The owner's stateroom provides comfort-



The "Ethel May II"—A Large Motorboat with the Comforts of a Home

able sleeping accommodations for two, and the main saloon for two. The dining saloon is forward on deck and is unusually spacious. A large round table built of mahogany and provided with extension leaves seats a company of 12 very comfortably.

The galley, adjacent to the dining room but below deck, is 15 ft. in width, and 5 ft. fore and aft. It is equipped with a four-hole coal range, large porcelain sink, hot-water boiler, a storeroom for dry groceries and fresh vegetables, an ice box having a capacity of 400 lb. of ice, and the usual equipment of cupboards and lockers.

The crew's quarters are forward under the dining saloon and in the forepeak of the vessel, affording a single stateroom for the captain and four berths for the crew.

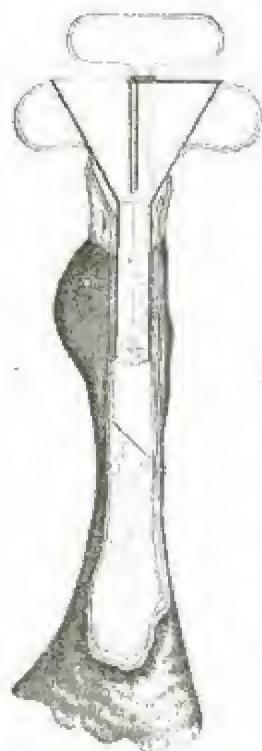
The engine room is of unusual size, and affords ample room for the engineer to inspect all the moving parts of the engines. A berth for the engineer is provided in the engine room. An auxiliary electric-light plant, operated by an 8-hp. gasoline engine, is direct-connected with the bilge pump, fire pump and air compressor. The vessel is, of course, electrically lighted, and the windlass on the forward deck is driven through spur gears by a 4-hp. electric motor.

The small-boat equipment is out of the ordinary. Each motorboat has a 14-ft. rowing dingy and a 16-ft., 5-hp. motor tender carried on davits on the port side, and a 20-ft., 40-hp. express tender carried on the starboard side. These express tenders have a speed of 25 miles an hour.

MECHANICAL FEEDER FOR GEESE

In France the geese which are intended to supply the main ingredient of the delicacy "pâté de fois gras aux truffes" (goose-liver paste with truffles), are kept confined in narrow cages. The slightest movement is thus prevented, and food is forced down their throats, often with nothing more than a tube and stick, in order to produce an extraordinary development of the liver.

The drawing illustrates a newly devised instrument for this mechanical treatment, which in a measure alleviates the inhumanity of the forced feeding, in that it does not injure the throat or prevent breathing. It consists of a funnel of galvanized iron, provided



with a piston which cannot protrude beyond the end of the tube. At the lower end of the galvanized iron tubing is a section of rubber tubing.

DEVICE TESTS ENGINE CYLINDERS

When an automobile engine has four or more cylinders, it is highly important that the power of one cylinder should correspond with that of the other cylinders, or smooth running is impossible. Careful tests are made and indicator diagrams taken when the engine is turned out, and an English firm has now placed on the market an engine-testing device which indicates the compression of each cylinder while the automobile is in actual use.

The indicator is attached to the dashboard of the car among the usual array of indicating devices, and each cylinder is connected up to it by a pipe provided with a special valve. Under ordinary running conditions, the indicator and pipes are shut off from the engine, but by turning a valve, shutting off the spark and allowing the engine to run by momentum, the compression of each cylinder can be tested

in a few seconds. Should there be a leaky valve, or any other cause of loss of pressure in the cylinder under test, it is at once shown on the indicator, the pressure generated by the explosion also being shown. Thus the maximum pressure in each cylinder can be compared with that in any of the others. Also, when the operator is giving the engine a little less or a little more air, or advancing the spark, the indicator shows, by the rise or fall of pressure, the exact moment when the adjustments are perfect.

AN ELECTRICALLY OPERATED LIFT BRIDGE FOR CANALS

A novel lift bridge, probably the prototype of many others to be used in a like connection, has recently been built over the Miami & Lake Erie Canal, in Cincinnati, at a cost of nearly \$50,000. The bridge is of steel, with concrete foundations for its piers, and weighs 400,000 lb. The lift is 8 ft., which is sufficient to permit the passage of the ordinary type of canal boat. A solitary watchman is the only operator needed, and owing to the use of counterbalancing weights in the piers



COACHING THE DRIVER OF A RACING CAR

The Motor, London suggests that in future automobile races an airman in a fast aeroplane could rise and ascertain the relative positions of rival motor cars and then descend and inform the automobile driver.

at both sides, the elevating is performed by a small electric motor, or may be done manually when required.



Lift Bridge over Canal in Cincinnati

MOTORISTS' REPAIR COUCH

With this ingenious couch, the repairman finding it necessary to work under an automobile in a garage may easily pull himself in and out, he is kept from contact with the cold and



Repair Couch in Use

dirty floor, and his head is supported in a comparatively comfortable position by the adjustable head rest. Work under a car cannot, at best, be other than irksome, and if the work takes any length of time, a support for the head is necessary, otherwise the neck soon becomes cramped.

SAFETY FINGER-NAIL CUTTER



This ingenious little instrument, constructed on the lines of the safety razor, has been invented by a Frenchman as a safety finger-nail cutter. The drawing shows the simple way of inserting the blade, which is held securely by screwing down the handle of the device.

The edge of the blade projects four hundredths of an inch beyond the guard.

Sound lumber, 25 years old, has been conclusively proved by German government investigators to be materially stronger than new stock.

BOTANICAL GARDEN IN ALPS

Situated at an altitude of 7,200 ft. on Little St. Bernard Mountain, in the Alps, is a botanical garden which has just reached its completion after 18 years of work. The idea was conceived about 1880 by Abbé Chanoux, for 50 years rector of the hospice on the pass over the mountain, and the garden has been named "Chanousia" in his honor.

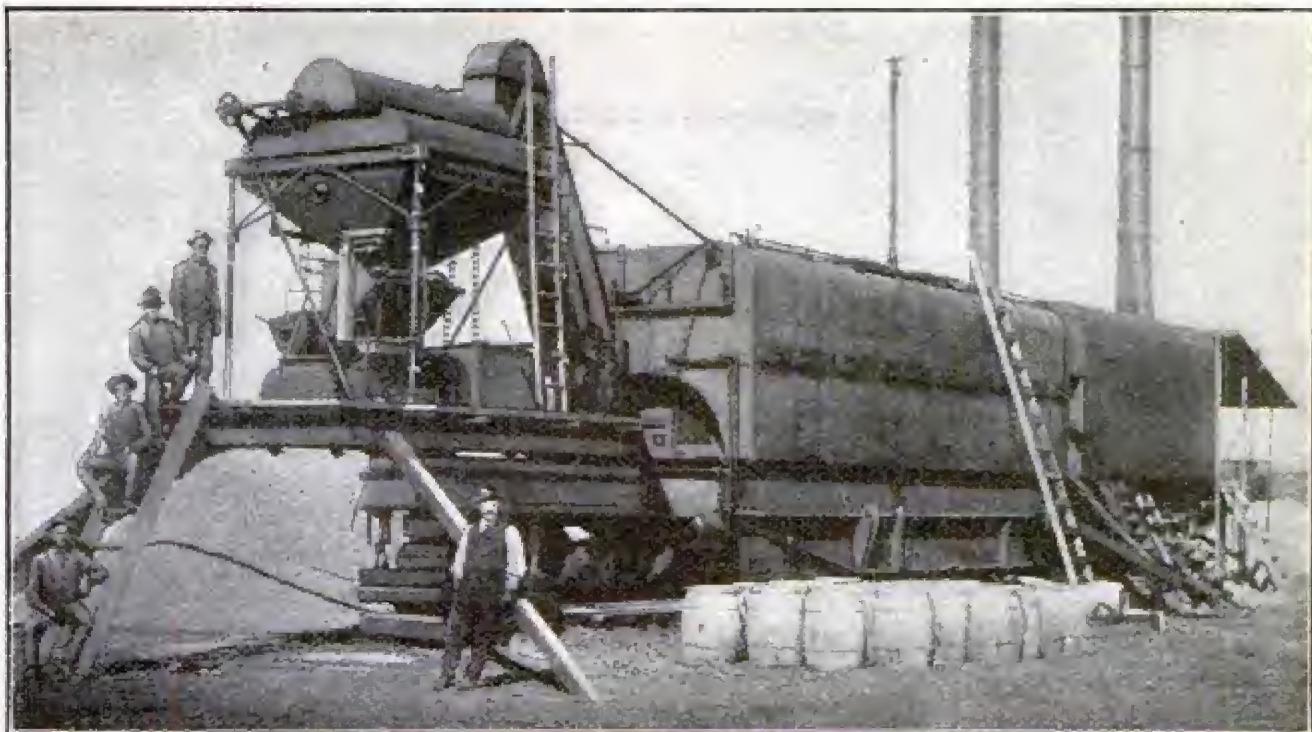
The Chanousia garden may well claim to be a living museum of the mountain flora of the world, for in it can be seen more than 2,000 thriving species representing the whole Alpine region, the Dalmatian, Balkan, Carpathian and Caucasian mountains, the northern highlands of Europe, the Himalayas, and the mountain ranges of Canada, America and Japan.

The ground occupied by the garden was donated by the little community of La Thuile, in which it is situated, and is surrounded by a retaining wall more than 2,000 ft. long. The different soil conditions under which the specimens thrive have been faithfully imitated. There are terraces of earth and sand, little lakes and marshes, caves, crevices, grottoes, etc.

PORTABLE ASPHALT PLANT

This portable one-car asphalt plant is claimed to have a capacity of 1,800 sq. yd. of 2-in. topping or 4,000 sq. yd. of 1-in. binder in 10 hours. The overall length of the equipment is 67 ft., and the trucks are of 100 tons' capacity.

The hot sand tank, screen mixer and mixer engine, hoisting engine and elevator engine are all on a sliding platform, which is extended by means of two large screws, so that teams can drive under it to receive loads. The hot sand tank is raised when in operation by means of hand screws, one at each



Huge Portable Asphalt Plant in Operation

corner, and lowered when the plant is to be transported, which makes the removal of the tank unnecessary during passage.

The engines required for the operation of the plant are direct connected with steel pinions and gears, no belting being used. The asphalt is heated with steam provided by a 125-hp. marine boiler. The plant is equipped with two independent tanks, each having a melting capacity of 712 cu. ft. The condensed steam from the tanks is returned to the boiler by means of a hot water pump, working automatically. The sand drum is 28 ft. long by 5½ ft. in diameter.

SIX-BLADED MOTORBOAT PROPELLER

A new speed propeller, for which much is claimed, has six blades so arranged as to form a perfect screw. It is so designed that each blade in every revolution gets solid water regardless of the speed, the blades being in sections of two with a difference of 4 in. in diameter of each section, the rear pair of blades being the largest. Tested on a 26-ft. motorboat equipped

with a 10-hp. engine, this propeller is claimed to have added three miles an hour to the speed, at the same time doing away with much of the jarring



Propeller with Three Pairs of Blades

and shaking which is so usual in small motorboats.

REAL SANITARY MILK CAN

The sanitary inspector of Saloniki, Turkey, has introduced a milk can which is fitted with valves allowing liquid to be poured out, but not in, after the can has been officially inspected and sealed. This is to prevent adulteration and fraud.

EXPLOSION OF 17 TONS OF DYNAMITE AT SEA



Blowing Up a Shipload of Dynamite

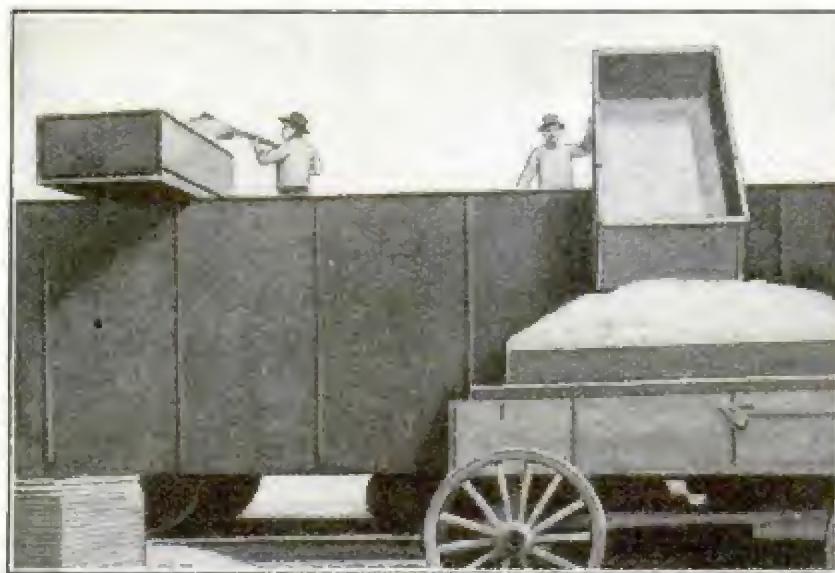
The explosion of 17 tons of dynamite off the coast of England, near

Yarmouth, recently presented a spectacle that gave onlookers an opportunity of learning what would happen if all the magazines on a big man-of-war were to blow up at once. In this instance, the dynamite was exploded deliberately for the purpose of ridding the seas of a water-logged ship, the "Mystery," the hold of which contained the explosive. The "Mystery" collided with another vessel and a hole was stove in her side that caused water to flow in and made her a dangerous derelict. It was decided to blow up the ship and cargo. Fuses were fixed, electric wires attached, and the crew embarked in a small boat. When a mile from the ship, the circuit was closed and the big charge was exploded. The explosion threw a huge column of water hundreds of feet into the air, of such volume that the boat was completely obscured. Nothing remained of the "Mystery" but bits of wreckage.

RAPID UNLOADER FOR RAILROAD CARS

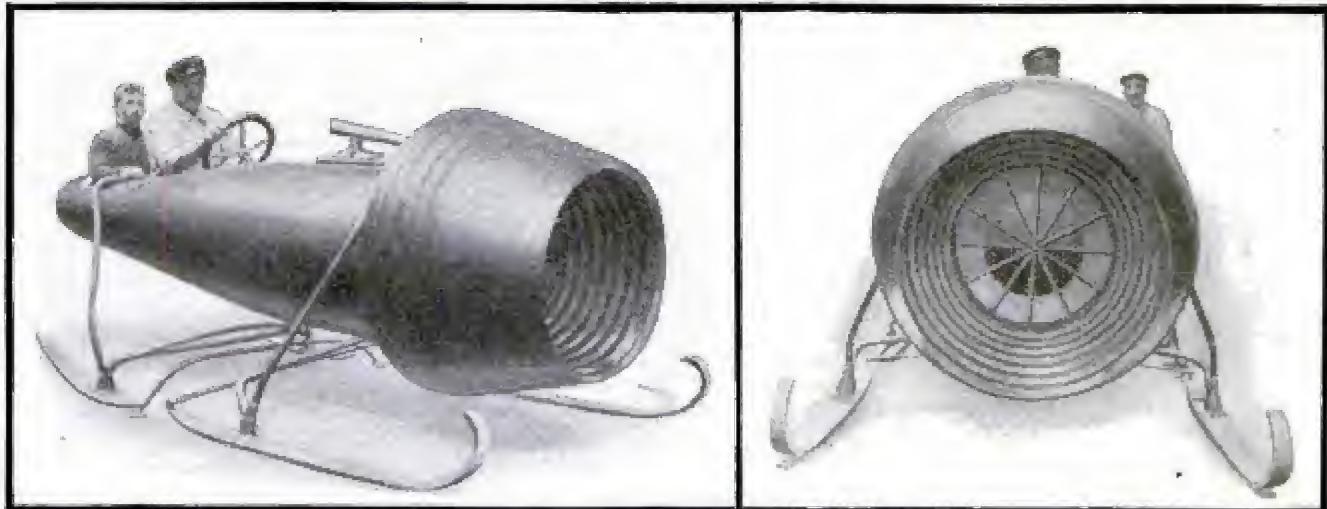
The rapid unloaders or loaders shown in this illustration are designed

shoveled from a railroad car into a wagon. The device is a steel box of $1\frac{1}{2}$ -yd. capacity, placed on top of a car, centering on the edge. The inner half is supported by a rail that lies across the car, one end of the rail having a $\frac{1}{2}$ -in. plate that hooks over the edge of the car under the box. The other end of the rail is held down by a chain. At the inner end of the box is another chain which keeps it from tilting while being loaded, and likewise regulates the elevation of the box while discharging. The box is kept from sliding off the car, when tilted, by two brackets, one on each side, against the inside of the car.



From Car to Boxes to Wagon

to facilitate the handling of coal, sand and other like material that has to be



Sleigh Driven by Suction Turbine

SUCTION TURBINES SERVE AS AIR PROPELLERS

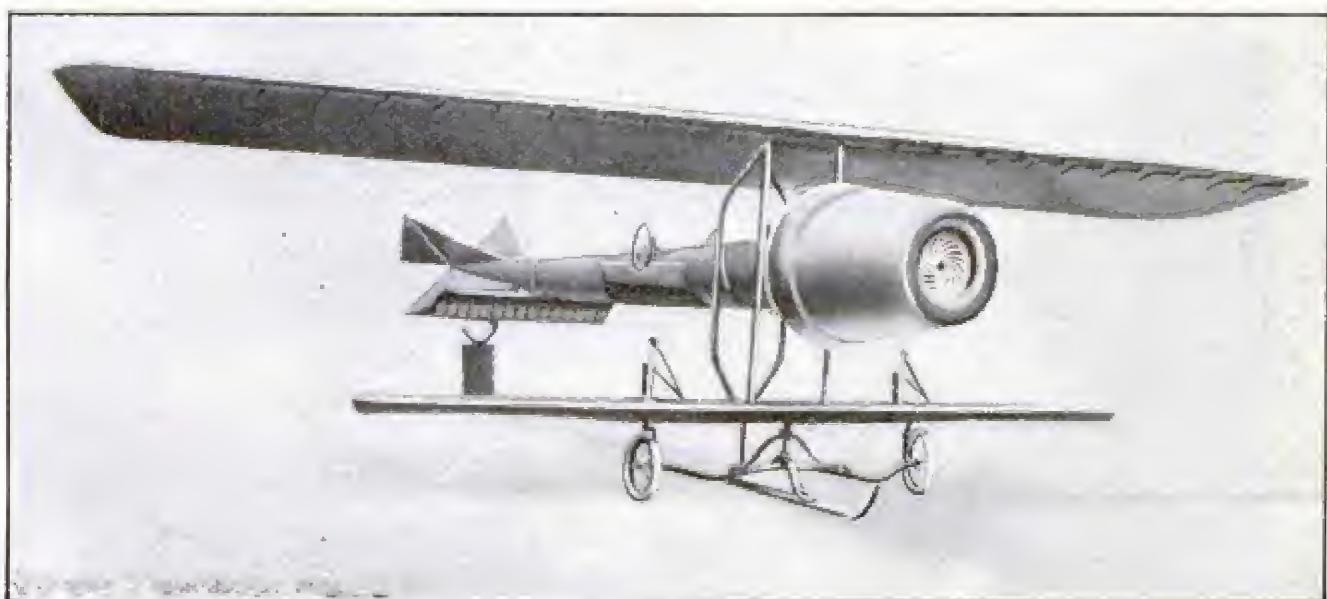
Motor Sleigh Propelled by Suction Turbine

The motor sled for the Grand Duke Cyril of Russia is provided with a power plant of the same type used by M. Coanda in his wooden aeroplane. It has a cigar-shaped hull carried on four runners. The suction turbine, which is mounted in front and driven by a 40-hp. motor, is expected to give the sled a speed of 50 miles an hour. Steering is accomplished by causing either end of a curved bar to bear on the ice or snow, the sled turning on this as a pivot. The sled was baptized by priests of the Russian Church.

Wooden Aeroplane with Suction Turbine

The Coanda aeroplane, exhibited at the last aero show in Paris, has several radically new features, chief among them being the method of propulsion and material used in its construction.

Aside from the ribs, and the uprights between the planes, this aeroplane is made entirely of wood. The body is long and fish-like, and the cone mounted on the forward end incloses a suction turbine, which takes the place of the ordinary aeroplane propeller, and forces the machine forward by drawing in and forcing back the air.



Suction Turbine Drives Wooden Aeroplane

ALTITUDE RULE AND AERO-PLANE RAG LEVEL

Two interesting devices used by the Wrights, one on the ground and the other on the machine, are a simple altitude rule and an ordinary rag. The altitude rule, which, while not absolutely accurate, is close enough for ordinary purposes, consists of an ordinary yardstick on which is a slide having two raised points exactly 1 in. apart. By placing the end of the rule to the eye when one of the Wright machines is directly overhead, and moving the slide until the ends of the wings are sighted just between the two points, the user can determine the approximate altitude. The planes of the standard Wright machine are about 40 ft. wide, and multiplying this number by the number of inches the pointer is away from the eye gives the altitude. The accuracy of the device depends upon sighting properly and having the aeroplane directly overhead. For very high altitudes, the pointers are set $\frac{1}{2}$ in. apart, and the number of inches multiplied by 80.

The rag spoken of hangs from the front frame, and, although hardly more than a strip of tape, fulfills the purpose desired as well as the most expensive instrument that could be designed. If the rag points up, the operator knows his machine is going down, and if it points down, he knows it is going up. If it flutters out straight behind, the machine is keeping an even keel, but if it points to the side, the

operator knows he is "skidding," and the machine must be brought back to balance by the use of the wing tips.

ELIMINATING THE FLICKER IN MOVING PICTURES

Flicker in moving pictures is said to be practically eliminated by a cinematograph which employs two projection lenses, converging on a common center, and used simultaneously with two identical films. Shutters are contrived so as to project the picture from one part of the apparatus while the picture from the other is being cut off.

AN ORNATE ROYAL SLEIGH

One of the oldest sleighs in existence is a much decorated vehicle used by Louis XI of France, which is now to be seen in the palace of Versailles. This sleigh is believed to be more than 450 years old and is regarded as a fine specimen of the vehicles of its age. It is highly ornamental, no part of it being left without some form of carving or other decoration. It is provided with comfortable seats for two persons, in the body, with steps and seats for footmen and attendants at the back and sides. On the high dash,



Ornate Sleigh Once Used by King Louis XI of France which reaches a peak, is found the crown of France supported by cupids.

Electric locomotives probably will be used for towing ships through the Panama Canal.

RAISING ANGORA GOATS IN THE SOUTHWEST

By C. L. EDHOLM

Two
Kids
of
the
Ranch



One of the ways in which the semi-arid tracts of this continent can be profitably utilized is in the raising of angora goats, an infant industry which has tremendous possibilities. In Arizona and other parts of the Southwest, ranchers are making a good living from land which is worthless for agricultural purposes, and in other cases the homesteaders are making their herds do the work of clearing the land of brush for later farming operations. The angora, like the goat tribe generally, can pick up a living where other animals would starve. It feeds on the dry brush of the desert, and by reason of its agility finds pasturage in spots which would be too rugged for cattle or sheep. In the mountains of Arizona, angora goats may be seen feeding along the sides of high cliffs which at first glance appear absolutely

inaccessible to any creature without wings.

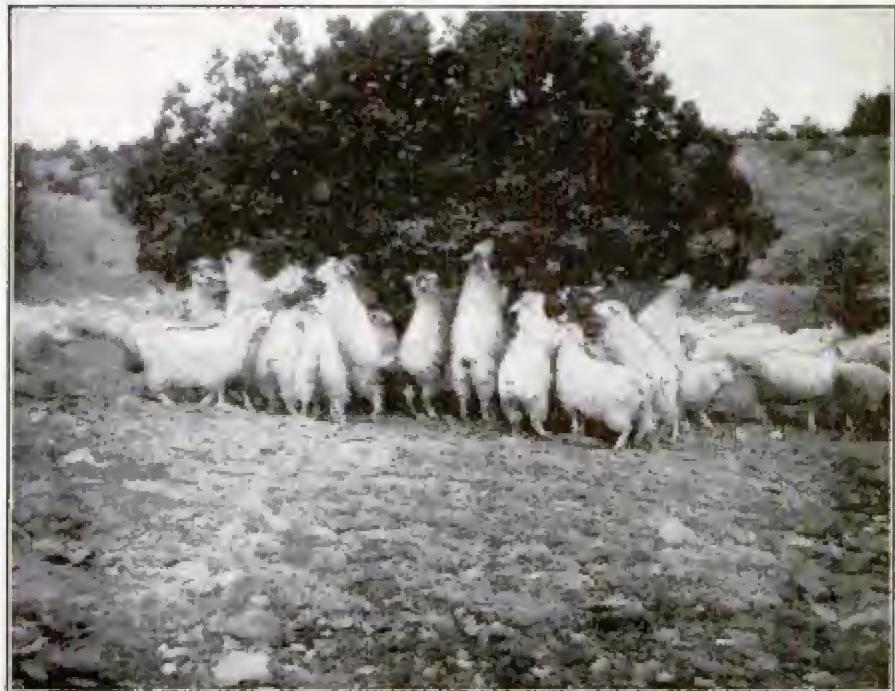
The chief source of profit from the angora goat is its long, silky hair which commands a price of from 30 to 40 cents per pound. Each animal yields 3 lb. of hair a clipping, and the herds are sheared twice a year.

As an addition to our meat supply, the angora goat appears to have a great future, as the flesh is said to be better than mutton; in fact, the Mexicans will not eat mutton when they can get goat flesh. The tallow and hides also find a ready sale, the latter being in great demand for making certain fancy varieties of leather goods.

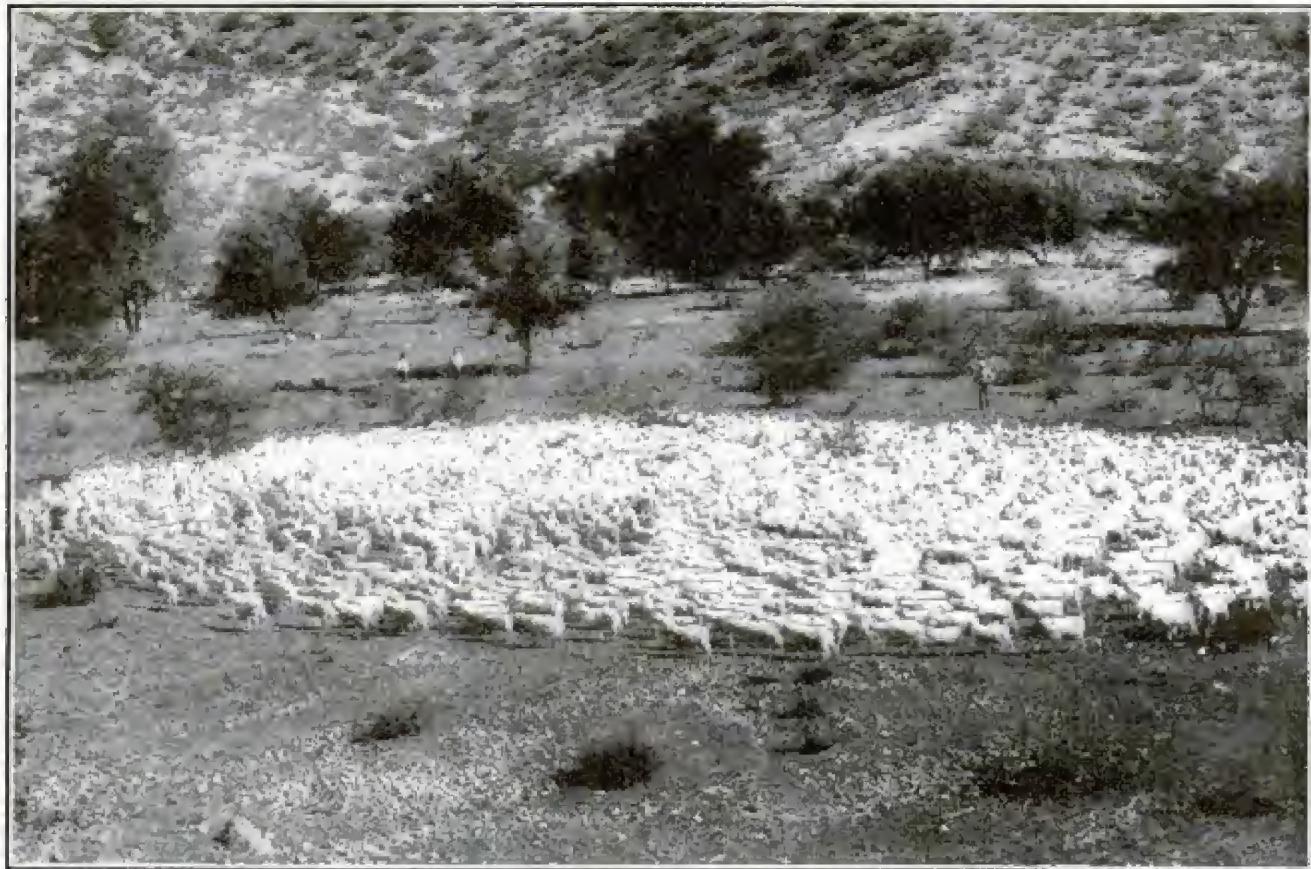
As a milk producer, the angora goat surpasses the cow both in quality and proportionate quantity, and in the making of fine cheese such as is imported from Germany and Switzerland,



New-Born Angora Kid—"Funny as a Goat"



Angora Goats Feeding on Alligator Juniper Tree in Gila National Forest, New Mexico



Goats "Wheeling." As They Will Not Stand Still the Only Way to Keep Them Bunched is to Keep Them in Motion about a Central Point. Note Barren Soil on Which They are Grazing

the goat milk would be superior to cow's milk. The average yield is about two quarts or more a day. In those parts of the Southwest frequented by consumptives, the goat's milk is in great demand as it is very rich and nourishing and quite easily assimilated. Indeed, the prejudice against ordinary goat's milk is accounted for by the ragged-looking animals seen browsing around in the vicinity of cities. It would never occur to anyone who has seen one of the beautiful, silky-haired angoras, to feel at all squeamish about partaking of its flesh and milk.

In view of the constantly increasing price of beef and wool, the importance of the angora can hardly be overestimated. With the decrease of the rich pasturage required for cattle, the price of beef is not likely to be reduced, and it seems as if the goat meat might compete with it in the market, as there are almost limitless areas of rugged country upon which such herds could be profitably raised.

The problem of cheap clothing,

which at the same time does not mean inferior material, may be partly solved by the more extensive raising of the angora.

The increase of the herds is very rapid, being estimated at 120 per cent per year, and the animals mature very early. As the rams are kept separate from the herd except for a brief period every year, the bearing season is over in a few weeks during the spring, at which time the herds are kept in corrals so that the young can be given proper care and attention.

The new-born angora kid is one of the most comical little creatures ever brought by the stork, as it stands with its long wobbly legs well braced in four directions to keep from falling and calls to its mamma. Even at birth it has a coat of the long, silky, white hair which distinguishes the breed.

The value of the goat in clearing overgrown farms, or arable land which merely needs to have the brush removed, has already been noted. One illustration shows the energetic man-

ner in which the goats are attacking a scrub juniper, and is an earnest of how thoroughly they would clean out any smaller brush or weeds. This is a matter that means dollars and cents to the rancher in the western country where labor is costly.

The angoras are exceedingly restless and when it is desired to "bunch" them for any purpose, they will not

stand still, so the rancher adopts the maneuver known as "wheeling." The goats are kept constantly in motion around a central point or pivot. One of the illustrations shows them in the act of circling round and round in this manner.

The angora was introduced from Turkey into this country in 1849, by Dr. J. B. Davis, of Columbus, S. C.

HAREM SKIRT TO CROWD OUT HOBBLE

The old philosopher whose wisdom found expression in the saw that history repeats itself, as well as the gentleman who announced that events of human life move in cycles, need no more fitting proof than is given in the ever-changing styles of woman's costume. Years ago the world was startled by the introduction of "bloomers." The form and style of feminine habiliments have compressed themselves from the crinoline to the hobble skirt since then, and now comes a Paris manufacturer of women's apparel who announces the fact that he has at last an opportunity to introduce his "harem" skirt, which is nothing more nor less than a pair of bloomers which fit close at the ankle instead of just below the knee. He calls it a divided skirt that fits tightly at each ankle and it is referred to as the natural successor of the hobble skirt, which this Paris dressmaker believes has had its day. No petticoats will be worn with this new garment.

SERVIA HAS NOVEL WAY OF DISINFECTING VISITORS

Because of the prevalence of cholera in many parts of Europe, extraordinary measures are being taken to protect the health of the people. The government health authorities of Servia and Roumania have adopted the expedient of meeting all travelers at the borders and subjecting them to rigid inspection. In some instances inspectors



Courtesy of the Graphic
Servian Health Inspectors Meeting and Disinfecting
Visitors as a Precaution against Cholera

armed with tanks full of disinfectants spray peasants with the contents of their tanks. In the case of a person who has been exposed to cholera, the suspect is required to remove his clothing, which is placed in an oven and baked, and then the man is sprayed with disinfectant.

© Horse tramways will disappear in London before the close of 1912, states an English authority on traffic; the horse-drawn omnibuses and the hansom before the close of 1913; and all four-wheeled horse-drawn vehicles before 1921.

DETERMINING THE RATE OF SOIL EVAPORATION

The effect on evaporation of a layer of dry, granular soil when placed above



Tank Used in Determining Effect of Mulch in Preventing Evaporation

moist soil, has been tested by a number of experiments with tanks of the kind shown in the accompanying illus-

tration. The tanks, which are water-jacketed and hold about 1,500 lb. of soil, were placed in the open under normal conditions of sunshine, wind and temperature, and weighed at stated intervals.

In one series of experiments the soil received an irrigation of 6 in. over the surface. In the tank in which the soil had not been provided with the layer of dry, granular soil, more than one-third of the water evaporated in 32 days, while less than one per cent was evaporated in the tank protected by a 9-in. mulch.

The result of the series of experiments has led authorities to conclude that the western orchard owners can prevent the greater part of the evaporation losses by cultivating the orchards to a depth of at least 6 in. soon after each irrigation.

CONCRETE SNOW SHEDS IN CASCADE MOUNTAINS

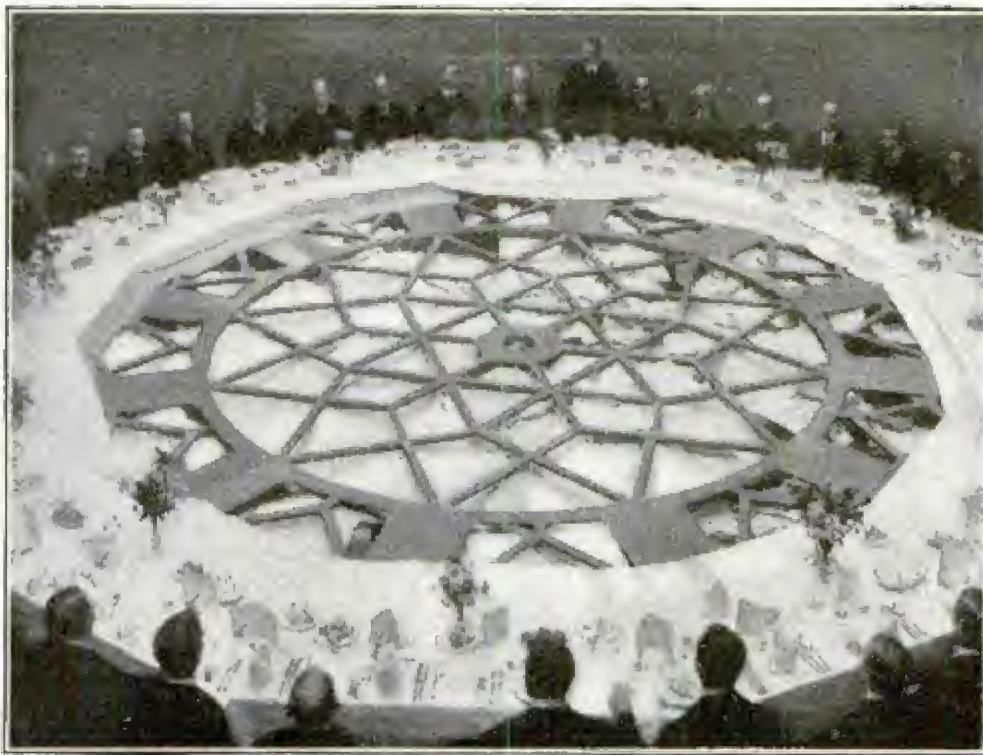
On account of the danger of destruction by forest fires of the great wooden snow sheds in the mountains of the west, the Great Northern Railroad decided to construct them of reinforced concrete. About 4,000 ft. of concrete sheds are now being built just west of what is known as the "long tunnel" in the Cascade Mountains, where snow slides are unusually severe.

ERECTING OVERHEAD EQUIPMENT ON ELECTRIC ROAD



Construction Train for Overhead Construction on Electric Railroad

Some quick work was accomplished in erecting the overhead equipment for the Rock Island-Monmouth division of the Rock Island-Southern Railway Company, in Illinois. The illustration shows the construction train working on the overhead equipment. This train consisted of four cars on which temporary elevated trestles were erected, together with a



Banquet of 50 Covers, in the Free Trades Hall, Leicester, England, around the Dial of the Electric Clock for the Liver Building, Liverpool



One of the Minute Hands, Showing Comparative Size of 6-ft. Man.

car fitted with a derrick and donkey engine for handling the mast arms, etc. These latter were installed, on stretches of the work, at the rate of 40 in nine hours. When this number of arms had been installed, the cars were coupled together, the hangers for the messenger and trolley wire put in place, and the wires strung. The stringing and clipping of the wire were done at the rate of $3\frac{1}{2}$ miles a day.

LIVERPOOL CLOCK RIVALS BIG BEN

With a dial 2 ft. bigger in diameter than that of the famous Big Ben which booms its deep-toned bass from the clock tower of the British Houses of Parliament, the giant electric clock now being erected in the Liver Building at Liverpool, England, sets a new English record in the building of mammoth public timepieces.

The remarkable photographs reproduced herewith not only show the huge proportion of the great dial, but also indicate in a most graphical manner the keen publicity instinct of the makers of this all-British clock.

The clock will occupy a position 220

ft. above the ground. The four dials are each 25 ft. in diameter, and the minute hands are 14 ft. long. Some idea of the size of one of the minute hands will be gained from the illustration, and from the fact that the free end of the hand will move at the rate of more than $15\frac{1}{2}$ in. a minute, or more than a fourth of an inch a second, which is quite a visible motion, if one is close enough to the hand to observe it.

The driving mechanism of the clock is constructed on the principle known as the "waiting train" movement. This permits the timekeeping element to be mechanically independent of the hand-driving element, and thus prevents any disturbance by wind, rain, snow, etc., of the time accuracy of the clock. It is also unnecessary to ascend the clock tower for the purpose of winding. Regulation is controlled electrically from the Greenwich Observatory, which is the great time-keeper for the British Islands and near-by parts of Europe.

Seven billion lemons were grown in Spain and the Italian provinces of Calabria and Sicily in the last two years.



VOISIN'S NEW TAILLESS BIPLANE

The horizontal and vertical rudders are placed about 32 ft. in front of the two main planes, and the operator's seat is 6½ ft. in front of the planes. The rotary motor is placed at the rear, half way between the planes.

SHOT GETTING THE BETTER OF ARMOR PLATE

The shot appears to be getting the better of the armor in the never-ending contest between the two, according to Rear Admiral Mason, chief of the naval ordnance bureau. He says that the conditions and outlook with regard to armor-piercing projectiles, formerly unsatisfactory, have improved very much during the past year. The quality of the shells supplied by certain firms is better and the outlook is more satisfactory than for several years past, though the lack of an adequate supply of large caliber shells continues to be a matter of serious concern. On the other hand, the advance in armor has not been entirely satisfactory so far as thick plates are concerned, and certain new processes, while giving promise of ultimate improvement, have failed to lend themselves to the installation of the armor on shipboard. In the meantime the older processes are being left behind. But thin plates have shown marked improvement and the hardening methods limited to 2-in. plates have gradually been extended to plates up to 4 in., and it is possible they may be definitely extended and thus solve the problems existing with regard to thick plates.

BAND STOPS PLAYING WHILE CROSSING BRIDGE

Because the tread of the musicians and the musical vibrations would cause the bridge to shake with such force that it would be unsafe, the band, at the recent dedication of the mammoth McKinley traction system bridge across the Mississippi river at St. Louis, went across the structure carefully and quietly. The leader of the band 15 years before had, at a similar ceremony, unknowingly led his organization, the men marching to the beat of the drum, upon a bridge and caused it to rock alarmingly.

GERMANY PREPARING SOUTH POLE EXPEDITION

The proposed German South-Pole expedition under Lieut. Fillchner has taken on the character of a great national undertaking, as the Kaiser, Prince Henry of Prussia, the imperial government, army, navy and leading German scientific bodies are all actively and officially identified with it. Much of the money required for outfitting the expedition was raised by public lottery and private subscriptions.

The expedition will sail in the late spring.



A Steam Shovel and Traction Engine Arrangement That Will Go Almost Any Place

COMBINED TRACTION ENGINE AND STEAM SHOVEL

One of the latest things in excavating machinery is the combined traction engine and steam shovel shown herewith. This outfit requires no rails on which to run and can be moved from place to place by its own power without the heavy expense of disassembling the engine part.

Several of these outfits are now doing good work in this country. They are especially useful for digging drainage and irrigation ditches, excavating in gravel pits, and for other similar purposes.

CARRY BROAD-GAUGE CARS ON NARROW TRACKS

An interesting system by which the freight cars of standard-gauge railways may be transported over narrow-gauge lines, thus making possible the delivery of loads in an unbroken condition, is being utilized on the Leek and Manifold-Valley Light Railway in England. The standard-gauge cars are run onto the low-built transportation cars or trucks in the manner shown in the accompanying illustrations, and locked in position. The railway upon which the transporter cars run has a gauge of but $2\frac{1}{2}$ ft.



Transporter Car Ready to Take Standard-Gauge Car



Running English Broad-Gauge Freight Car onto Narrow-Gauge Transporter



Musician Arranging Music from the Orchestral Score, Using an Arranging Machine

CANNING MUSIC FOR THE MECHANICAL PIANO

By L. E. CROZIER

The music roll used in mechanical pianos is a familiar object to most persons, but its manufacture involves far more than a simple translation of a music score into perforations in a piece of paper, as on first thought might appear to be all that is required. Except in the case of certain classics, the music of which is full enough without any doctoring, a piece to be played on a mechanical piano must be edited and elaborated by an expert, for otherwise it would sound pitifully thin and tinny when played by an unthinking and unfeeling piece of mechanism.

There are many varieties of mechanical piano players. In a typical kind there is a tracker-board containing longitudinal slots under each of which is a pneumatic tube leading to

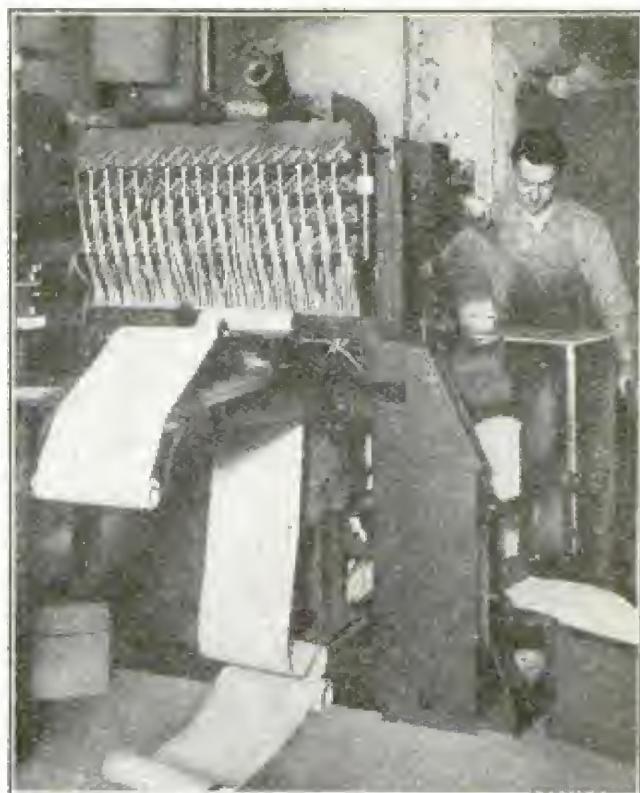
and controlling the action of a lever or "finger" which terminates in a leather-covered hammer for operating one of the keys of the piano. The music roll contains perforations corresponding to the notes to be played, and when one of these perforations comes opposite one of the slots or holes in the tracker-board, a free passage is made for a draft of air which operates the finger, and thus the note is played. The air draft is created by the action of the performer's feet on a pair of bellows, or by an electric motor. The note is held until the perforation is passed, the length of time depending on the size and shape of the hole.

It can be readily seen that the man to whom is entrusted the editing of

the music for the mechanical piano, must have as thorough a knowledge of harmony and composition as the original composer, if he is to give anything like a just interpretation of the latter to his audience. He must also thoroughly understand the needs of his instrument, for he is its soul. Preferably, also, he must be master of several other instruments, for often he does his arranging not from the piano-forte, but from the orchestral score. The work offers to a competent musician with a mechanical turn the same opportunity as the editorial department of a musical publishing house.

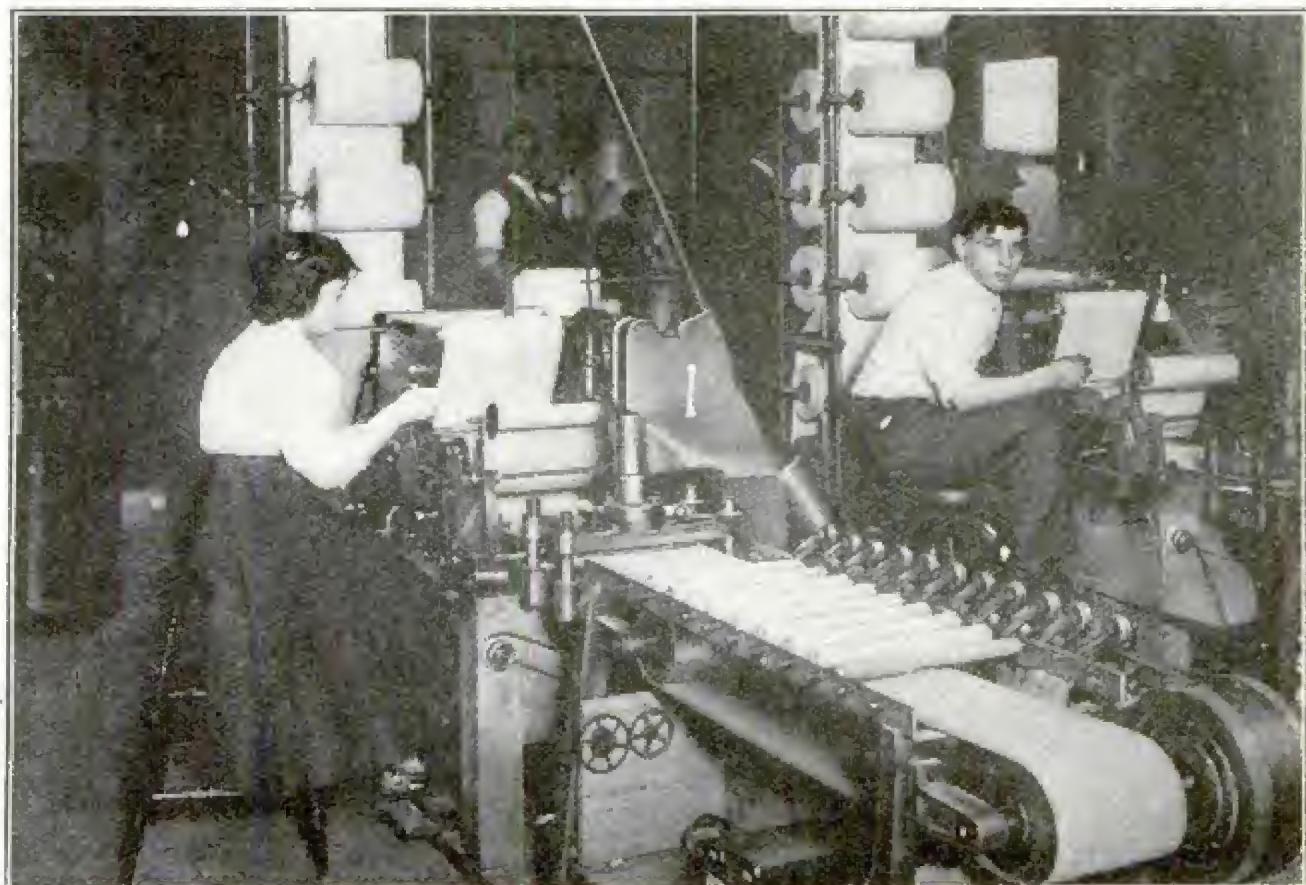
Seated at an arranging machine with a keyboard like a piano, the musician applies by a touch of his foot to a treadle, the power of an electric motor. This sets in motion a drum at the back which revolves with clicks like a stock ticker, but carries an 8-in. paper in place of the ribbon.

He plays the music just as he would on an ordinary piano, only more slowly, choosing his notes, and insert-

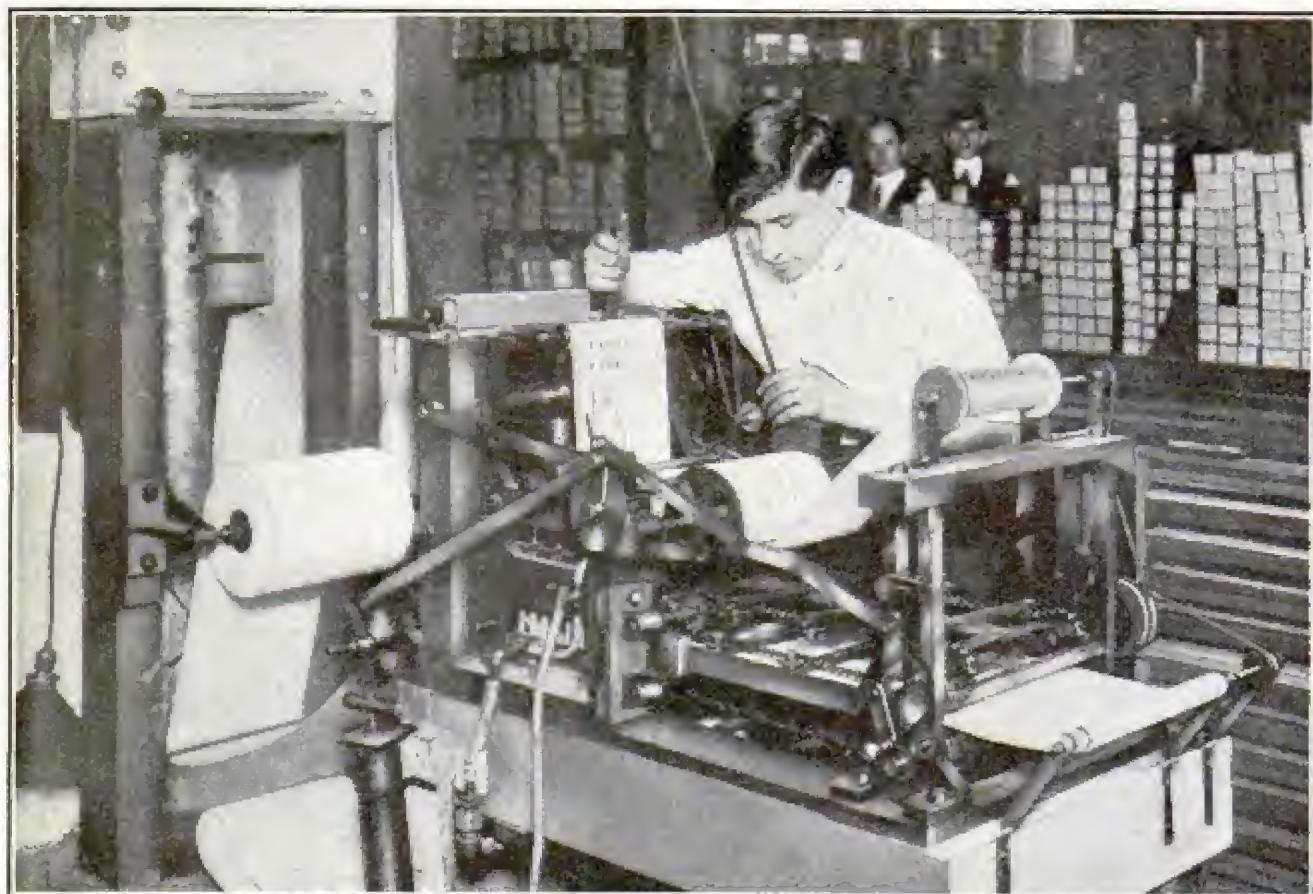


The Machine Which Changes the 88-Note to the 65-Note Master

ing others as he goes. If he wishes to record a half-note, for instance, he presses his finger on the key and



The Machine Which Changes the Punches of the Master Roll to Slits, at the Same Time Punching and Winding Up Ten Other Rolls

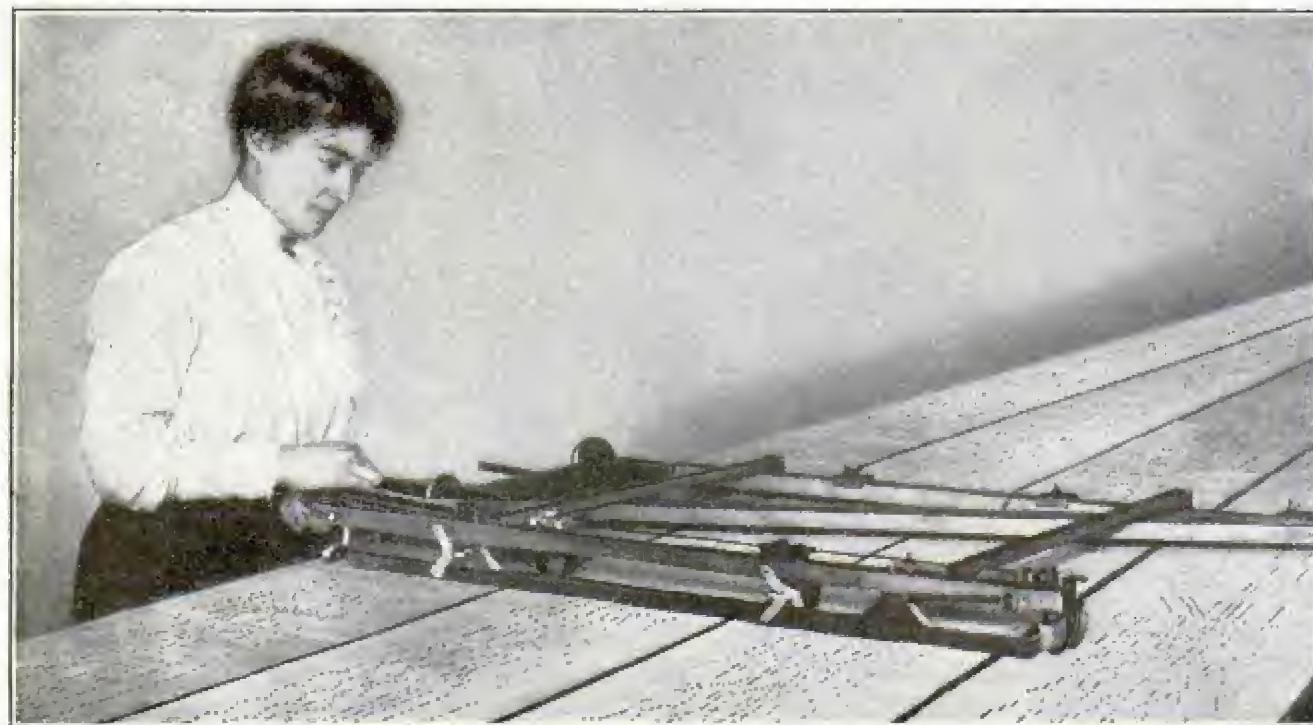


The Machine Which Uses the Narrow Master of the Arranging Machine to Produce a Wide Heavy Master for Reproduction, and a Thin Test Roll

counts eight clicks. There is no other sound, but on the paper appears a vertical row of eight perforations.

This narrow "master," as the paper roll is called, is then run over the tracker-board of a machine which also

responds with punches instead of notes. It perforates two rolls, one a heavy paper, used for reproduction, and the other a thin test roll. The latter is tried on the piano and corrected by the musician.



The Marking Table, Where Expression Lines and Printed Directions are Put On

From this the heavy master, too thick for the tracker-board of the piano, is corrected by hand. Its extra perforations are pasted over, and missing ones inserted with a mallet and punch. It is then run through a machine which changes the round perforations of the master to slits where necessary, at the same time reproducing the corrected master upon ten other strips of paper. Each of these strips unwinds from its own large roll, and rewinds, its perforations complete, upon the familiar black spool which is inserted in the piano.

There is also a machine which changes the 88-note master which has previously been edited by hand by the musician, to a 65-note master. This is then reproduced by a machine which perforates and rewinds ten rolls at once.

All the rolls then go to the marking

table where they are spread out two at a time and the dotted expression lines put on by a semi-automatic marking machine. Words in regard to expression are printed by hand by means of rubber stamps. The guide for this marking is a perforated roll, marked by hand by the musician. The rolls are then rewound by means of a hand reel, and carried to the inspection tables, where they are checked over for blemishes. They are then spooled, labeled, tested and boxed, and stored on shelves (called "bins") to await shipment.

Perforated music is not a special invention for the mechanical piano, however. It has for many years been used by the humble hand-organ, and the early patents are all held by Italians. By recent legislation the composer whose music is adopted for the mechanical piano is entitled to royalty.

ANOTHER "LARGEST" LINER STARTED

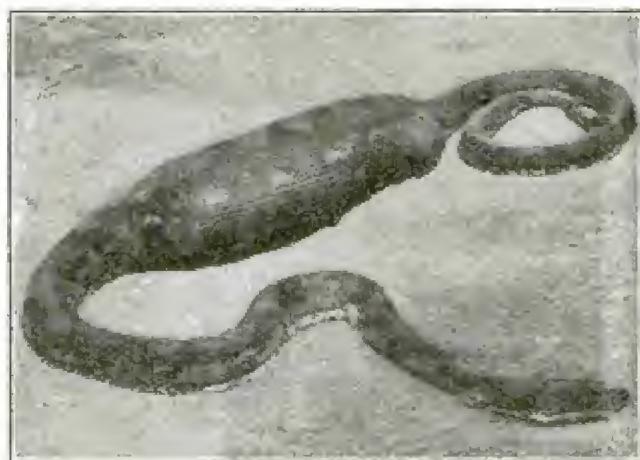
The huge White Star liners "Olympic" and "Titanic," which will succeed the "Lusitania" and "Mauretania," before the year is out, as the largest ships in service, will hold this distinction for only a short period, and then will be superseded by the "Europa" of the Hamburg-American line.

The "Europa," the keel of which has already been laid, is a 50,000-ton ship, 900 ft. long, with a beam of 96 ft. She will have nine decks above the water line, and will accommodate 4,250 passengers. Just what the accommodation features will be, and to what extent they will be worked out, has not been fully announced as yet, but they will include many of the things featured as unique in the planning of the "Olympic" and "Titanic," along with others never before attempted.

It required 123,754,000 cross ties, valued at \$60,321,000, to make repairs and build new railroads in the United States during the past year.

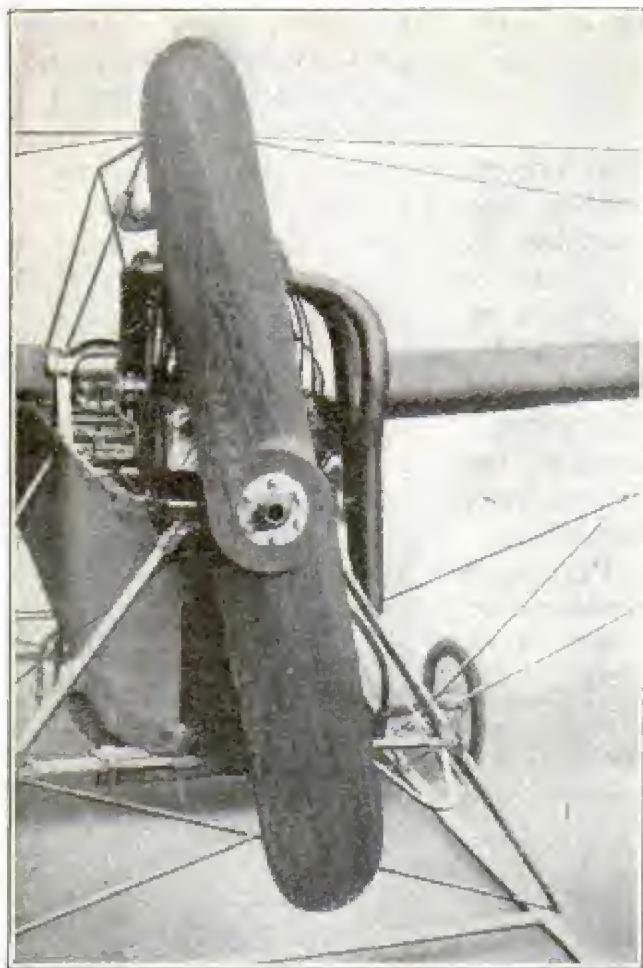
GASTRONOMIC FEAT OF A BOA CONSTRICTOR

By reason of their peculiar anatomical formation snakes are able to devour other animals much larger in



Boa Constrictor after Having Swallowed a Full-Grown Pig

circumference than themselves. Recently in India a huge boa constrictor was made to act as model for the accompanying photograph showing one of these gastronomic feats. A full-grown pig was given to the snake and the boa swallowed the animal with ease.



A NEW FORM OF PROPELLER

The air is attacked at the center instead of at the ends of the blade, as in the usual design. Though it is only 6½ ft. long, it has given as good results as an 8-ft. propeller of the ordinary type. It was made in France and is known as the "Rip."

BIG WAR FUND REGARDED AS PEACE GUARANTEE

The statesmen of Germany believe their war chest of \$30,000,000 in cash that has been idle 40 years, is the greatest factor for peace in the empire. The money is part of the indemnity paid by France at the conclusion of the Franco-Prussian war. It is packed in 1,200 chests and numerous bags. Each chest contains 100,000 marks and the bags 1,000 marks each. The chests and bags are each sealed with three seals and the vault in which they are stored is divided into three chambers, each of which has a different seal. The seals are inspected three times daily by three different officials, and the ministry of war has agents who make monthly and quarterly inspections. Several attempts to invest the money

have been resisted by statesmen who argued that the money provided Germany with a fund with which to commence war at any time without recourse to money lenders, and thereby gave the nation a feeling of security, while it had a deterrent effect upon any enemy.

HARVESTING SUGAR CANE BY MACHINERY

The sugar-cane industry will be practically the last of the great agricultural departments of this country to have its harvesting entirely done by machinery, if the cane harvester successfully demonstrated at New Orleans a few weeks ago proves to be reliable and efficient under protracted tests on a large scale.

This machine, which was drawn by four mules and is operated by a 6-hp. gasoline engine, cuts, tops and gathers the cane and dumps it onto the carts or wagons.

The machine has long arms which reach out and gather the stalks. The cutting and topping are done by revolving disk cutters. The leafless canes are then loaded by an elevator device into the carts which follow the machine.

It is claimed that one machine will cut ten acres of cane, weighing about 200 tons, in a day, at a cost of about \$7.50. Cutting the same amount by hand, it is said, costs about \$150. An increase in yield of about 12 per cent is also claimed for machine-cut cane,



Cuts 10 Acres of Sugar Cane a Day

by reason of the machine saving more of the bottom of the stalks than is possible with hand cutting.



Unique Steam Speed Boat Going 35 Miles an Hour

STEAM SPEED BOAT MAKES 39 MILES AN HOUR

"Cero II" is a wonderful little speed boat that has made a mile, unofficially, in 1:32, which figures out at a speed of a fraction over 39 miles an hour. But 31 ft. 5 in. in length, with a beam of 4½ ft., she is driven by an automobile steam engine of the compound marine type, which develops between 125 and 150 hp. The weight of the bare hull is but 639 lb., while the machinery weighs, 2,100 lb.

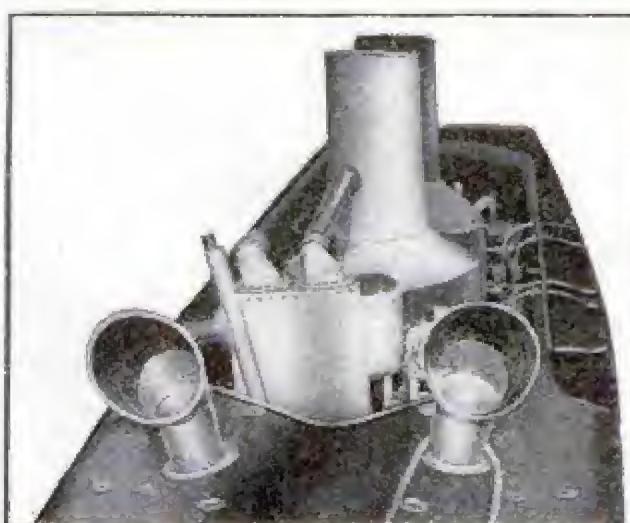
The "Cero II," which is owned by a Cleveland (Ohio) man, is almost straight along her keel and has a broad, flat stern. She appears perfectly flat-sided with no sheer to speak of when at rest, and up to 15 miles an hour just wallows along. At 20 miles an hour her nose begins to rise from the water, and at 25 miles, she shows a little more hull, but it is not until she passes these speeds that her design begins to prove itself. At 33 miles an

hour the nose is about as high as it can rise, and at still higher speeds it drops slightly closer to the water again.

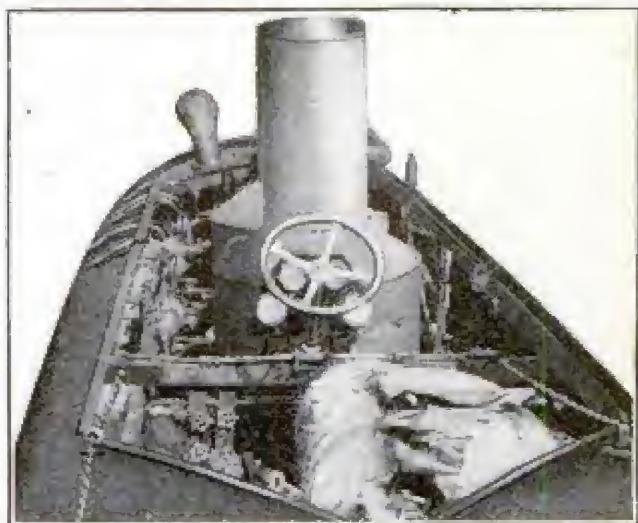
Steam is supplied to the engine by two generators of the endless coil type, placed over burners of the Bunsen type. The generators are aft of the engine, and have individual stacks, which carry away the exhaust and provide extra draft.

LOCATING BLOWN FUSES

It is sometimes a matter of time and trouble to locate a blown electric fuse in a bank of fuses. An English type of fuse has one end somewhat resembling a shooting target, in full view of the inspector. When the fuse blows, the central black disk or bull's eye, as it may be called, falls out of place and is caught in a recess in the "target," where it may easily be seen. Thus the blown fuse is immediately indicated.



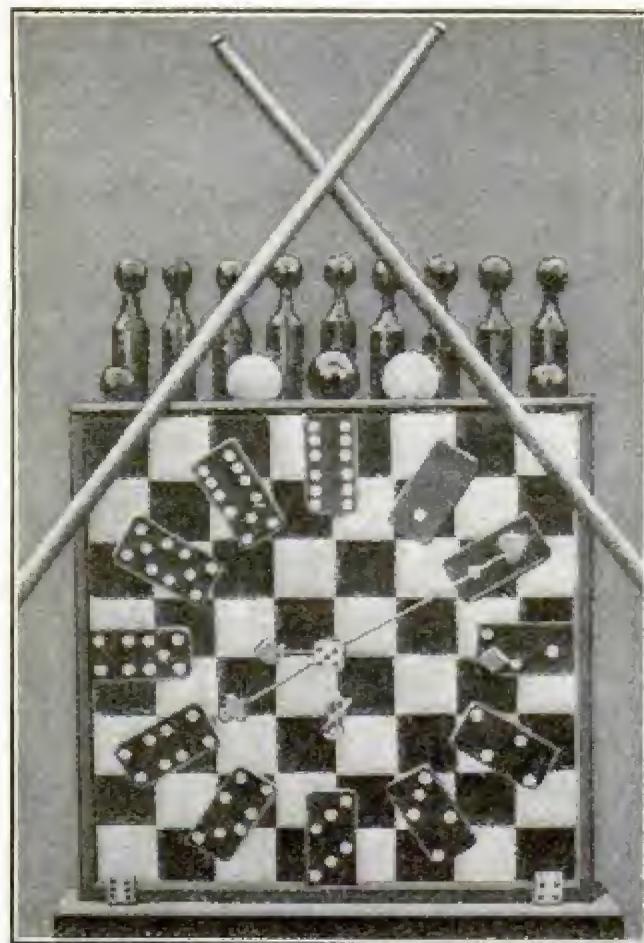
Front View of the "Cero's" Power Plant



As Viewed from the Rear

GAMING IMPLEMENTS USED FOR CLOCK FACE

The "Gamester's Clock" would be an appropriate name for a timepiece



The Gamester's Clock

that has just been constructed, which appears to have been made with all the implements for gaming that could be secured. A checkerboard furnishes it with a face, the numbers on which are made with dominoes of appropriate denomination. The minute hand is tipped with the figure of a "heart" and at its short end has a "club." A "diamond" serves to point the hours for

the hour hand, while a "spade" forms the butt of this hand. The hands are fastened to the clock with a dice, while the top is ornamented with a row of tenpins and billiard balls. Over the top a pair of short billiard cues are crossed.

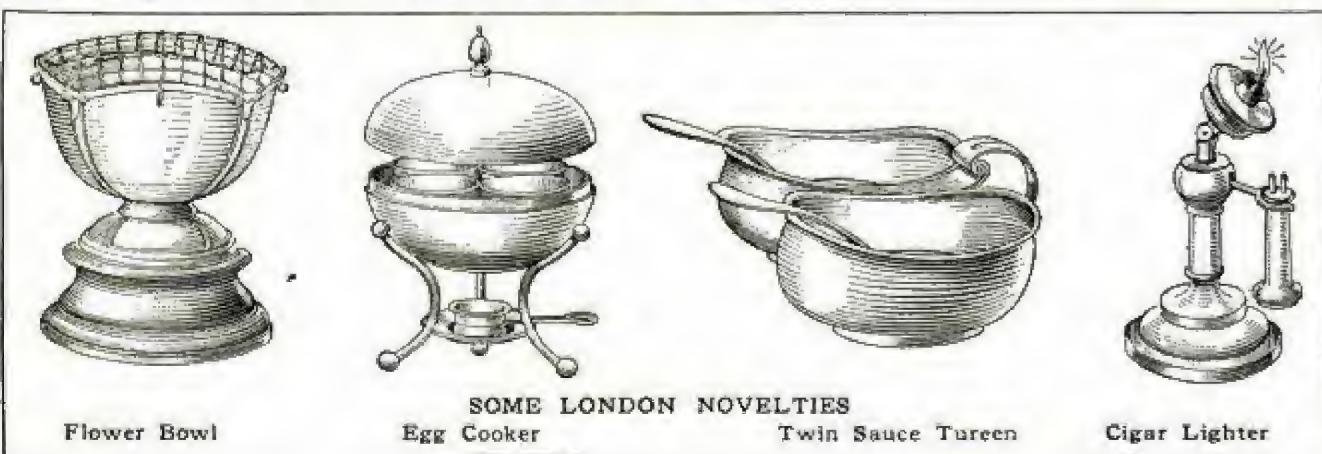
ELECTRIC METERS INSTALLED ON PORCHES

The manager of an electric-light plant in a small city has had the majority of residence meters installed outside, usually on the rear porches, but sometimes on the front. They are placed where rain and snow will not interfere with them, and are practically moisture-proof, having protecting glass covers.

The advisability of outside meters was impressed upon this manager through his own experience in reading meters. The time spent in cleaning his feet, waiting for the door to be opened, passing through the house, and possibly climbing to the attic, he considers absolutely unnecessary, to say nothing of the second calls required when the first finds no one at home.

NOVELTIES IN LONDON SHOPS

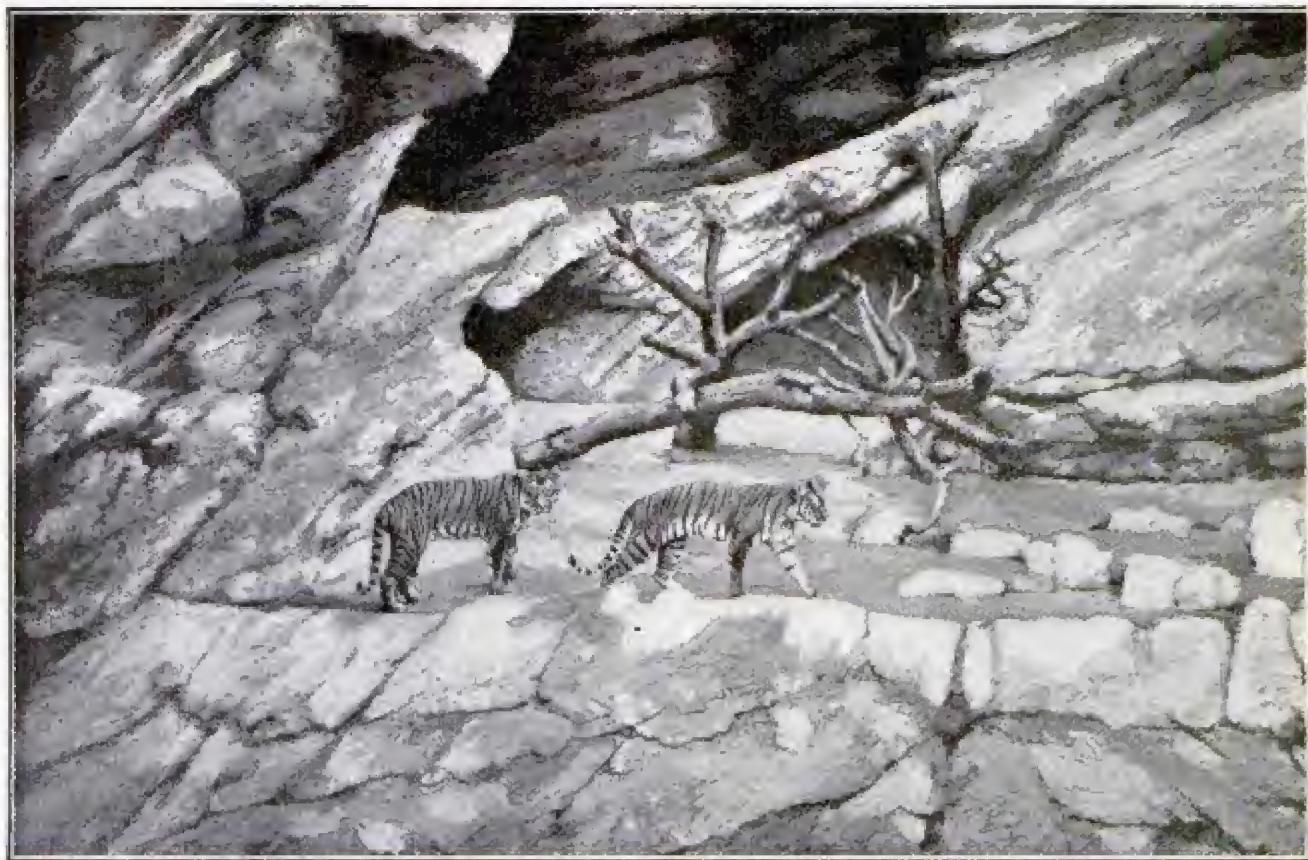
A few of the many novelties displayed in London shops to tempt buyers are shown in these illustrations. They include a special chafing dish arrangement for poaching or steaming eggs, a sterling silver twin sauce tureen, a telephone cigar-lighter novelty, and a flower bowl provided with a pedestal with a net for the arrangement of the flowers.



SOME LONDON NOVELTIES
Egg Cooker

Flower Bowl

Cigar Lighter



ROME'S NEW ZOOLOGICAL GARDEN

THE conception of a great zoological garden in which lions, tigers, and other wild animals are free to wander about without being separated from the spectators by the bars of cages, has been realized in the new zoological garden at Rome. Deep and wide trenches safeguard the spectators from attack, and the animals have a greater and more natural environment to prowl about in.

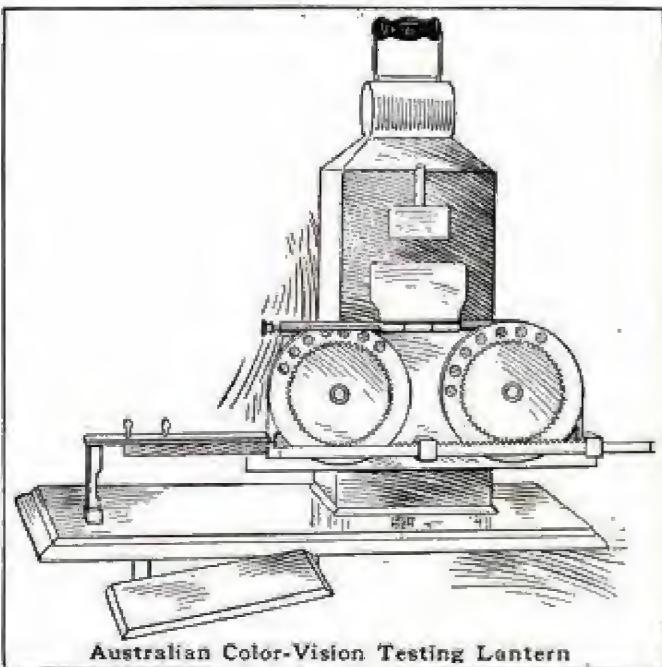
IMPROVED COLOR-VISION TESTING LANTERN

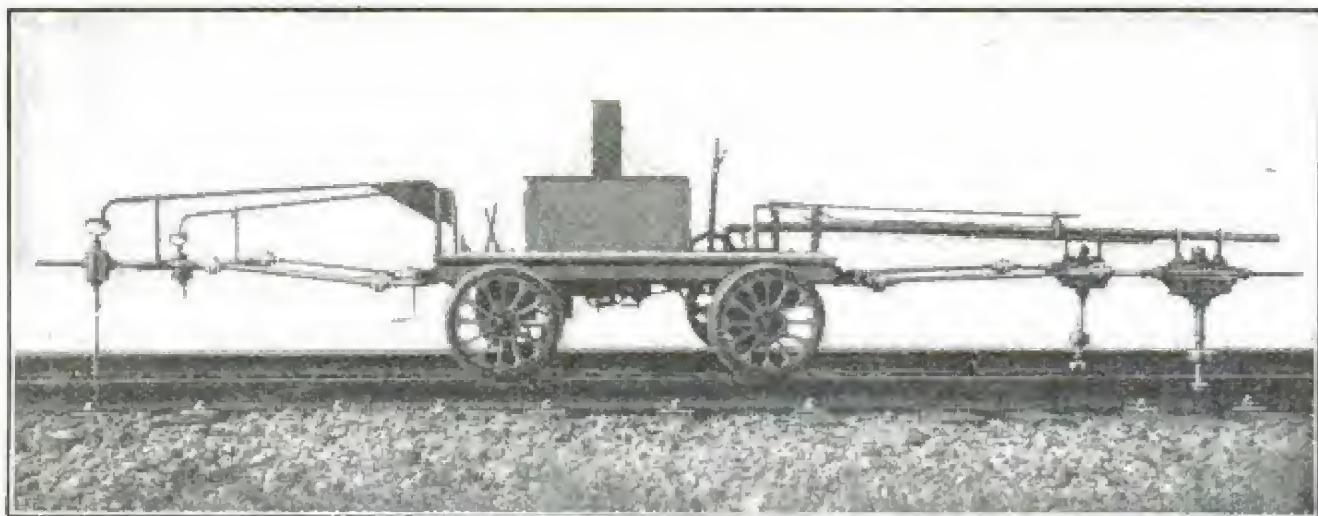
Experiments have developed the fact that, owing to the disks moving in a regular sequence, the colors in the vision-testing lantern used by the government railways of New South Wales, could be learned by persons with a defective color sense. Consequently, the examiner-engineer of the railways mentioned devised a second disk, which, used in conjunction with the old, makes possible various combinations at the will of the examiner.

The disks are rotated by means of handles at the side of the lantern, pointers indicating the numbers of the lights shown. The original numbers are retained, so that no alteration has been necessary in the method of keeping the records.

It is remarkable how a candidate in whom a defective color has been clearly demonstrated, even a defective sense of

red, can be tutored to deceive an examiner, when the old type of testing lanterns are used.



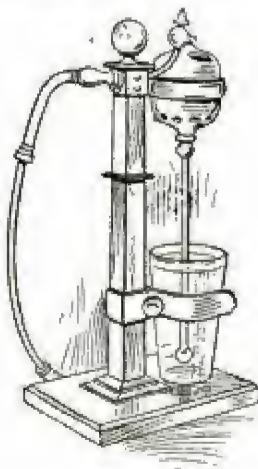


A Useful Car that Drills Holes in Rails and Drives Spikes

ELECTRIC MIXER BLENDS LIQUIDS QUICKLY

Ordinarily, two minutes or more are required to properly mix a beverage and even then the result is not always satisfactory, but with this electric machine the mixing is done in from 10 to 20 seconds, the flavors are thoroughly blended and the customers are saved a considerable wait.

The electric mixer is designed for soda-water fountains and bars, and consists of a 1/12-hp. motor, attached to a standard and operating a vertical shaft, at the bottom of which is a so-called applicator in the form of a button, so shaped as to set the contents of the mixing glass in motion. The ingredients of the beverage are placed in a mixing glass, which is adjusted in a holder. The operator then presses down the machine until the button is about 3 in. from the bottom of the glass, when the motor starts automatically. Raising the machine automatically stops the motor, which is claimed to have a maximum speed of 10,000 revolutions per minute. The motor is direct connected to the mixing shaft, and the operation is simple.



INGENIOUS POWER-OPERATED SECTION CAR

This ingenious little self-propelled section car has a gasoline engine powerful enough to permit of its pulling two or three push cars loaded with section men and supplies, as well as providing power for the operation of tools when stationary.

The accompanying illustration shows the car equipped for boring holes and driving screw spikes. The cranes extending from the drilling end of the car hold up the drills when they are not in operation, while those extending from the spike-driving end hold up the spike drivers at all times. In driving the spikes, all the operators have to do is to exert a downward pressure on the cranes and keep the drivers from slipping off the heads of the spikes.

In connection with a small auxiliary air compressor or electric generator, the engine may be used to operate riveting and other like tools at a distance.

In plowing a prairie of five square miles with a 12-in. plow, the man behind the handles would have to walk a distance of 26,400 miles, or a distance equal to the circumference of the earth at the equator plus that of a journey between New York City and Houston, Texas.

The Kingdom of Dust

By J. Gordon Ogden, Ph. D.

THIS is the first of a series of articles by Dr. Ogden, who is professor of physics at the Fifth Avenue High School, Pittsburg, Pa. In every home, in every office, in every shop or factory, the fight against Dust is never-ending. Dr. Ogden illuminates this subject in a manner which brings a realization of its infinite importance.

1—A Boundless Domain

VAST is the kingdom of dust! Unlike terrestrial kingdoms, it knows no limits. No oceans mark its boundaries, no mountains hem it in. No parallels of latitude and longitude define its boundless area, nor can the farthest stars in the infinitudes of space serve other than as twinkling outposts of a kingdom as vast as the universe itself. And what shall we say as to the component subjects of this kingdom? In number, form and variety, they transcend all conceptions of the human mind. In shape, they comprise every possible form. In position, they include every substance that is material. In condition, they are solid, liquid, vaporous and gaseous.

They are with us in the quiet seclusion of our homes, in the busy streets and marts of commerce, on the sunlit crests of the snowy Himalayas, out on the silent prairies, mingled with the desert's shifting sands, amid the ice of the frozen Arctic. They fall as ambassadors from space on the clouds of canvas—the wings of the flying ships, thousands of miles from land. They come to us enshrined in the beautiful snow crystals, and every drop of rain carries with it from the upper reaches of the atmosphere some of these tiny subjects of the mighty kingdom of dust.

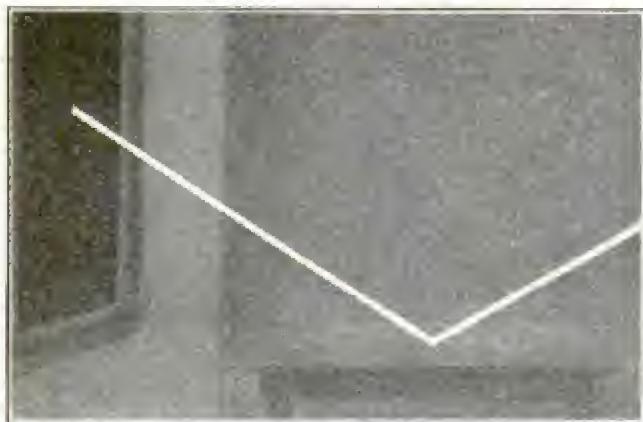
Dust would not be possible were it not for the fact that matter is almost infinitely divisible. A coin that is worn smooth in the course of years of

passing from hand to hand is a good illustration of this fact. The wearing away was not done by any one hand, but by the touch of many. Every time a finger was placed upon it, no matter how slight the pressure, tiny particles of gold, or silver, or copper, as the case might be, were removed. No scales used by man could possibly weigh one of these tiny metallic particles of dust, nor could it be seen with the most powerful microscope. Nevertheless, it has length, breadth and thickness, and the removal of it, and of countless others, made the coin smooth and worn.

One sometimes sees an old piano whose ivory keys have deep grooves worn in them by fingers that have long since become subjects of the kingdom of dust. As in the case of the coin, every time the hard ivory was touched, no matter how light the touch, small particles were dislodged to become errant soldiers in the great dust army.

Absolutely pure water will not permit an electrical current to traverse it. If a grain of salt be added to a hundred tons of perfectly pure water, the water becomes at once a conductor of electricity. It is supposed that the solitary grain of salt is divided into an almost infinite number of parts, and that each of these tiny motes of salt acts as a ferry by means of which the electric charge is enabled to cross the water. How extremely minute, then, must be these particles of salt,

when a single grain will supply ferry service for a hundred tons of water, every cubic inch of which must neces-



Beam of Sunlight in Darkened Room—The Reflection of the Light from the Dust Particles Makes It Visible to the Eye

sarily contain hundreds of millions of salt particles.

A single grain of musk will perfume a room for years, penetrating every portion of it, and yet not lose sensibly in weight. As it is supposed that the sense of smell owes its inception to the bombardment of the olfactory nerve by small particles of the substance that gives rise to the perfume, we may gather some notion of the extreme minuteness of these particles.

It has been estimated that an average puff of smoke from a cigarette contains about four thousand millions of particles of dust.

A single grain of indigo will give color to a ton of water; of course, every drop of this water must contain an immense number of ultra-microscopic particles of indigo. A few grains of fluorescein, a substance derived from coal tar, will produce a distinct fluorescence, shining with a yellowish green light when strongly illuminated, in a hundred tons of water. To produce this result, the fluorescein must be divided into countless billions of particles.

Professor Warburg of Berlin is to be credited with an excellent illustration of the divisibility of matter. He succeeded in weighing the invisible layer of vapor which condenses on a dry plate in a moderately damp room, and calculated that the film of water dust thus deposited was 500,000 times

thinner than the thinnest writing paper.

The process of division into extremely small particles of matter goes on right under our eyes when we see a match flaming or a candle burning. Some of the carbon of each passes off into the atmosphere in particles so small that they will remain suspended for hours and even days before they finally settle down on the floor or other resting place.

The ordinary incandescent electric-light bulb contains only about a millionth of an equal volume of the air such as we breathe. And yet the bulb is "full" of air, as the one-millionth that is left in the bulb after exhaustion by the vacuum pump, occupies every part of it, and the tiny molecules are constantly whizzing to and fro in countless hordes—untold billions.

Still another, and even more amazing, illustration of the extreme divisibility of matter is shown in the case of the sodium coloration of a flame by the addition of a minute quantity of common table salt. A millionth part of a milligram (1/65 grain) of salt, will be amply sufficient to give a distinctly yellow coloration to a flame. To do this, this millionth of a milligram must have been vaporized into a gas containing trillions of particles of sodium.

Down at the bottom of the sea, under three miles of water, there lies a dust so fine that when it is rubbed be-



Dust in Porcelain Dish after Evaporating Snow, and Clean Dish to Show Contrast

tween the fingers it enters the pores of the skin. This dust is the remains of the shells of plants and animals,

such as Diatoms and Polycystines. It is estimated that one cubic inch of the ooze that covers the ocean floor contains the remains of forty thousand millions of organisms, each as distinct in its individuality as is an elephant, and possessing a structure that is as perfect, so far as its use is concerned, as is the structure of the human body.

Every conceivable substance enters into the composition of dust. In street dust may be found bits of iron and steel from the tires of wagons, horseshoes, and the nails of our own shoes; bits of leather from harness, fragments of wood, cotton, silk, stone, gold, silver, clothing, wool, hair, animal excreta, various ores, tin, paper, clay, sand, molds, bacteria—in fact, everything under the sun.

Sometimes this dust is so abundant that it fills our nostrils and irritates the delicate mucous membrane, so that we are forced to withdraw from its vicinity. At other times the dust is so imperceptible that we are almost certain there is none present. And yet the air is always full of it, as may be observed quite readily by noting the enormous number of dust motes in a sunbeam passing through a darkened room. Even in the quietest, cleanest room of our home, the sunbeam reveals the unnumbered myriads of everything material that is constantly floating in the atmosphere.

shelf, picture frames, chairs and other objects in the room, as the careful housewife is ready to testify.



From Actual Photograph Showing Peculiar Movement of Dust in Air

A room left undisturbed for weeks at a time may appear to be free from dust, but let a beam of sunlight pass through it, and at once the multitudes of dancing, quivering, irregularly-shaped particles flash into view. Every breath we take entombs thousands of these particles, even under conditions where every precaution is taken to lessen their number.

The amount of dust that falls is enormous. It has been calculated that in February, 1891, the amount of dust that fell on the house tops of the city of London amounted to six tons per square mile. It is not improbable, as will be shown, that this quantity, enormous as it is, is equaled or exceeded in many of our American cities, where coal, especially soft coal, is used as a fuel. Chicago, St. Louis, New York, Philadelphia, Cincinnati, New Orleans and Pittsburg are dust-mantled cities. Millions of dollars are spent annually as a ransom to this mighty kingdom of dust, in order that its unwelcome ambassadors may take wings and fly away from our carpets, our curtains, our books, our windows and our streets. Unfortunately, they do not fly far, but settle down comfortably after a stirring seance with the dust cloth, broom or other cleansing agent. The fight against dust is a continuous one, and must be fought over and over again, the next hour or



Dust Particles from Pittsburg Schoolroom

Some of the dust finally subsides after floating for days or even months, and settles on the top of books, the mantel

day or month, depending upon the energy of the dust fighter.

Careful investigation has shown that even in the comparatively pure air of the country districts, remote from furnace and smokestack, there are over a thousand motes of dust in every cubic inch of air. A good, heavy fall of rain washes the atmosphere quite thoroughly, and for a few hours after this purification the atmosphere is comparatively free from dust. Falling snow acts in a like manner, and the beautiful white crystals always contain dust particles, gathered up in their descent through the air. If the fall be heavy enough, the atmosphere gets a thorough scrubbing. If freshly fallen snow be melted and evaporated, there is always an appreciable quantity of insoluble, residual matter. If snow is allowed to remain for a day or two on the roof, the heavy, black deposit of soot, so familiar to the dwellers in our large cities, is very much in evidence.

The writer recently gathered a quan-

tiny of snow three days after it had fallen, on the roof of the Fifth Avenue High School, Pittsburg. The snow was melted and the water evaporated. The quantity of snow taken weighed 52 oz. and covered an area of exactly 2 sq. ft. After evaporation, the residue weighed a trifle over six grains. A chemical analysis proved this residue to be principally carbon, with a slight trace of iron.

Three grains to the square foot may seem to be rather insignificant; but when we consider the total amount to a square mile, the dust deposit becomes quite impressive, being about 12,000 lb., or six tons. This means that during the winter months, at least, about 60 tons of dust fall monthly on the streets, house tops, and in the homes in every square mile of the Pittsburg district. No wonder that Pittsburg has acquired somewhat of a reputation among its envious rivals for its dust and dirt. It is certainly not spotlessly clean.

Of such is the Kingdom of Dust!

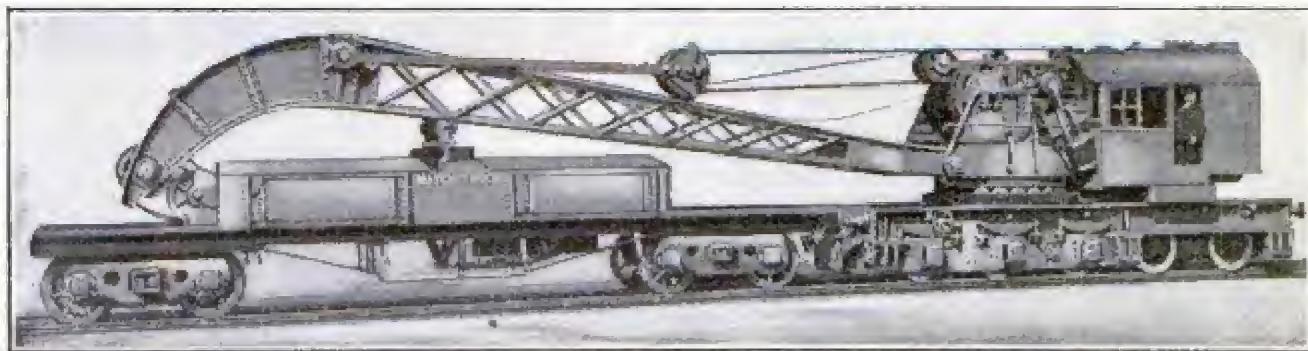


Siamese Convict Wearing Queer Neckyoke

YOKES FOR CONVICTS TO PREVENT ESCAPE

Though city dwellers are not so familiar with the device, every stock farmer has at one time or another been compelled to use a long yoke or hobble on some one of his herd of cattle or horses that made a practice of jumping the pasture fence, straying on a neighbor's property, or running away. This form of contrivance has been used for centuries in the Orient to prevent prisoners from getting away from their guards on the way from court to prison. In China the yoke is a heavy wooden wheel, the wearing of which sometimes constitutes the punishment meted out by the magistrate, the convict being sentenced to wear the yoke for a term of days or weeks. In Siam, a much longer form of yoke is used, the principle being about the same as applied to cattle in this country. If he attempt to escape by running, the poles are so long that they trip him.

WRECKING CRANE WITH UNUSUALLY LONG JIB



Powerful Railroad Wrecking Crane Which Has Radius of 40 Feet

The wrecking crane shown in the accompanying illustrations is one of the most powerful and practical ever supplied to a British railroad. It has an unusually long and high jib, of the lattice type, curved in form. The lifting power is 36 tons at a radius of 20 ft., and lighter loads up to a radius of 40 ft.

The conditions the builders of the crane were compelled to meet were, according to the *Engineer*, London, somewhat difficult. In the first place, it had to be constructed to clear the ordinary English railway loading-gauge, and a further limitation was met with in the specified condition that the load on any pair of wheels should not exceed 14 tons when the crane was



Crane in Operating Position

jib while in transit.

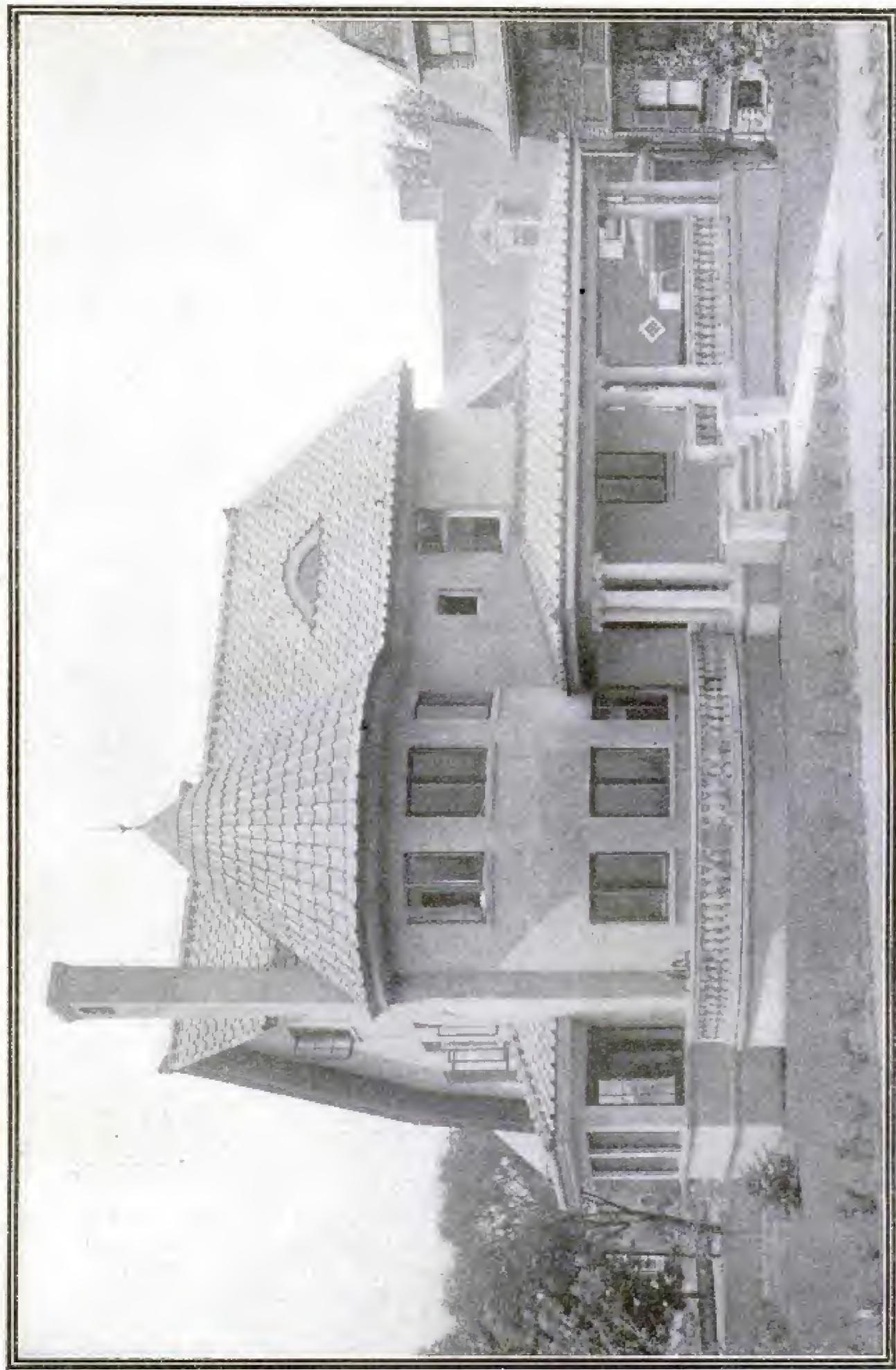
traveling with a train. These requirements were solved by arranging the crane with a large portable balance weight at the tail end. This weight can be moved in and out to suit different conditions of load, and can also be detached and lifted by the crane itself, onto the truck which carries the forward end of the

During the five years from 1905 to 1910 the United States sold goods to China in proportions, which, if evenly distributed among the 400,000,000 people, would have given each man, woman and child .06 of a cent's worth of American supplies.

BLERIOT OFFERS BARGAIN RATES TO PUPILS

While the art of aviation is comparatively new and all schools that teach it are of recent foundation, there has nevertheless been a sufficient number of the latter started to cause the founders to offer inducements to students. In France, where there are more aviation schools than elsewhere, Louis

Bleriot and his partner, LeBlanc, have taken the lead by offering the first ten students to matriculate for the next year greatly reduced rates. This is indeed a sign of the times. Bleriot offers his first ten pupils a full course for \$160. Bargain prices at all the other aviation schools are now in order.



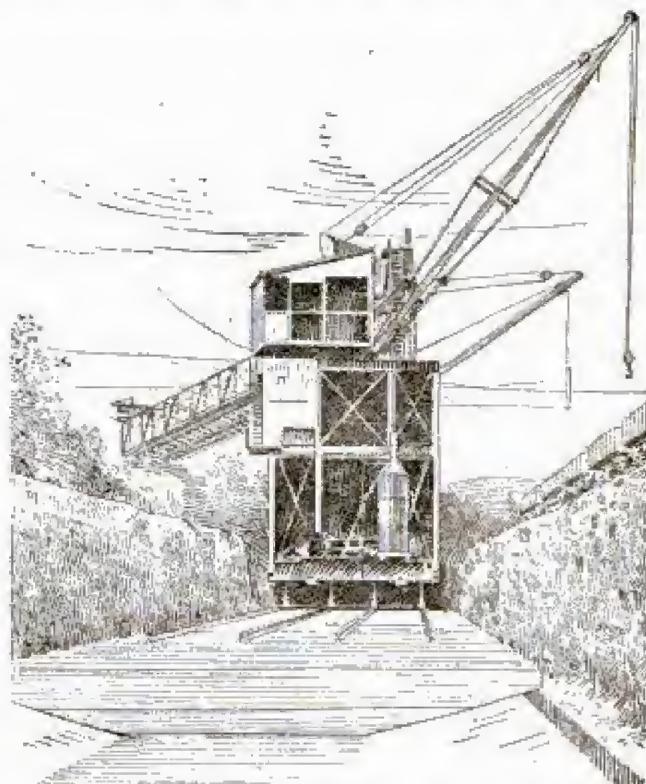
CONCRETE RESIDENCE OF DR. M. E. STEPHENSON, BOSTON, MASS. Built Without the Use of Forms or Molds. It Has 12 Rooms and Cost \$11,000

TRAVELING CONCRETE PLANT USED ON AQUEDUCT

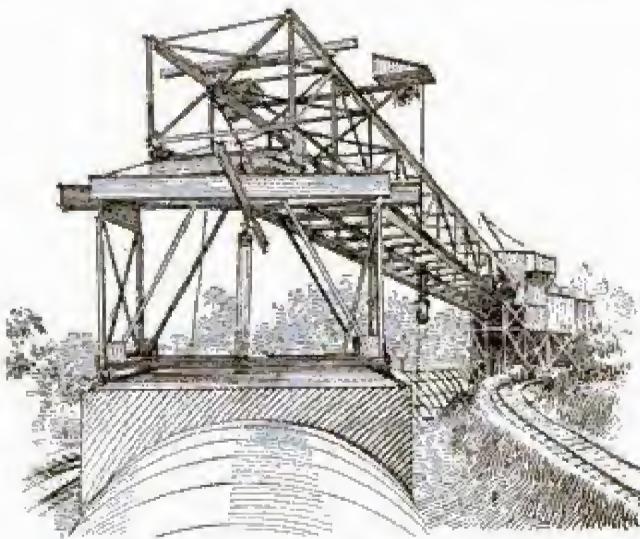
A traveling concrete plant, embodying several novel features, has been used on the Esopus cut-and-cover section of the Catskill aqueduct, which will furnish New York with its water supply. The portable plant is entirely self-contained, consisting of a mixer, crusher, storehouse, and conveying machinery for delivering the concrete to the side wall and arch forms.

The plant, which has built 60 ft. of aqueduct arch in a day, consists of a four-story framework of steel and a steel transporting bridge, 140 ft. long, one end of which is pivoted to the main structure, while the other is supported by steel saddles resting upon the arch of the completed aqueduct. A gravity mixer is mounted on one end of the plant and delivers concrete into buckets, which are picked up by an electrically operated traveler, running on the lower flanges of the I-beams extending the length of the bridge. This traveler carries the buckets of concrete out on the bridge and dumps them directly into the forms. The main struc-

the loading platform where the buckets are filled from the gravity mixer. The second floor carries the lower hopper of the mixer, and a 75-hp. electric motor,



Main Section of Traveling Plant Shown Just as it Was Rounding a Curve



Dumping End of Bridge Supported by Saddles on Completed Aqueduct Arch

ture is mounted on a car which runs along tracks in the trench as the work progresses, the ties being shaped to fit the finished invert upon which they are placed.

On the first floor of the four-story framework is a gyratory crusher and

which furnishes power for operating the elevator, sand roll, derricks, crushers and screens. The sand roll and the intermediate hoppers of the mixer are on the third floor, while the top floor is given over to a gyratory crusher, the top hoppers of the mixer, the sand and storage bins, and two derricks.

At a rate of 60 ft. per day, the work required of the plant was the mixing and placing of about 171 cu. yd. of concrete daily, and the taking down, moving and setting up of 60 lineal feet of steel forms.

CYeast, either dry as sold in stores, or fluid as it comes from the breweries, is said by Dr. Plantier, of Paris, to be a remarkable remedy for burns. It should be diluted with boiled, luke-warm water, and applied as soon as possible after the accident.

HOW TO MAKE A HALL TREE

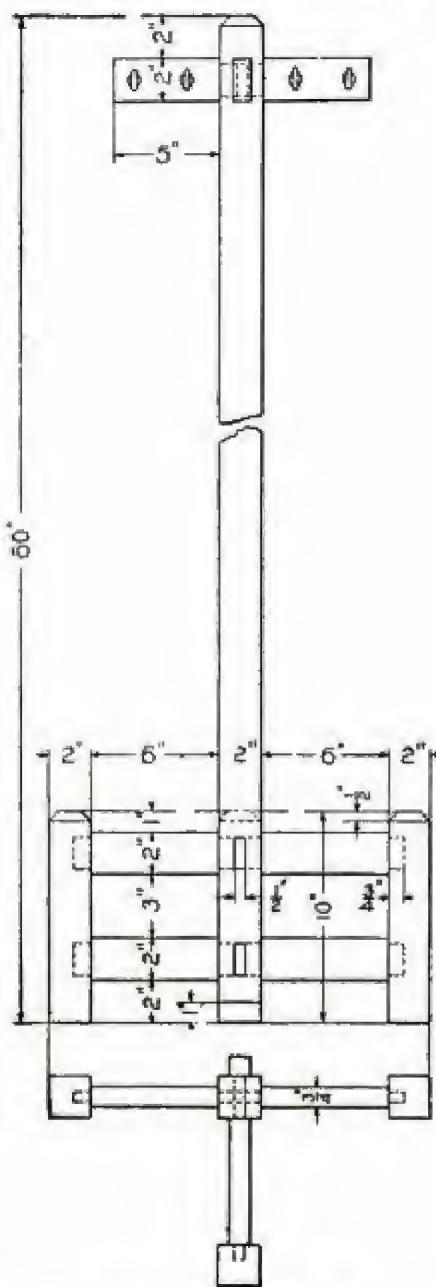
When making the hall tree shown in the accompanying illustration use



Hall Tree Complete

quarter-sawed oak if possible, as this wood is the most suitable for finishing in the different mission stains. This is a very useful and attractive piece of mission furniture and is also very easy to construct. The stock can be purchased ready cut to length, mill-planed and sandpapered on four sides as given in the following list:

1 post, 2 by 2 by 59 in.
4 posts, 2 by 2 by 10 in.
8 braces, $\frac{3}{4}$ by 2 by $7\frac{1}{2}$ in.
4 arms, $\frac{3}{4}$ by 2 by $5\frac{3}{4}$ in.



Details of Construction

match your other furniture. Purchase a few hooks at a hardware store and fasten in the upper arms as shown, and the hall tree is complete.

CA Swedish army officer has constructed an aerial torpedo propelled by a compressed-air motor. It is claimed to have an initial velocity of 984 ft. per second, and a maximum range of over 14,000 ft. Its charge consists of about 5 lb. of explosive.

First square up all the posts and bevel them at the tops as shown. Then cut the mortises, making them $\frac{1}{2}$ in. wide and $\frac{7}{8}$ in. deep. Cut the tenons on the braces to fit these mortises. Be careful to get the distance between the shoulders of the braces all of the same length. A good way to do this is to place them all side by side on a flat surface with the ends square and lay them all out at once. The top arms can be made in the same manner. The tenons should fit good and tight in all the posts.

The parts can now be glued and clamped together. When they are dry, scrape all the surplus glue from about the joints and go over the whole with fine sandpaper, removing all rough spots. Apply the finish you like best or the one that will

AN X-RAY EYE

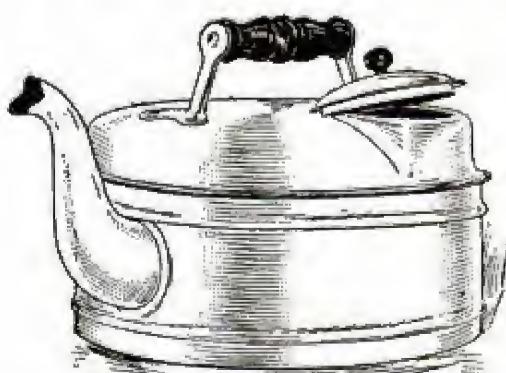
Dr. Rosig, of the Institute of Technology of St. Petersburg, Russia, has announced the discovery of an electroscopic apparatus which will give the user what might be termed an X-ray eye. He modestly claims the invention one of the most remarkable ever made by a scientist, and, according to reports, insists that it can be used to see through walls, to watch theater performances from the exterior of the building, etc.

ANOTHER TRANS-ANDEAN RAILROAD

Another trans-Andean railroad has been authorized by the Argentine Republic, the appropriation for construction being about \$8,000,000. The new road will connect the northern part of the Argentine Republic with Chili, while the original trans-Andean route links Buenos Ayres and Valparaiso.

TEAKETTLE WITH LID ON SIDE

A new teakettle introduced in England has its lid hinged and located in the top near the side, instead of being set under the handle in the usual manner. The person filling the kettle can lift it by the handle and hold back the cover with the fingers of the same hand, while the other hand is used to



New Position for Teakettle Lid

operate the water tap. With the lid in the new position, all danger of having the hands scalded by escaping steam is removed.

WINDOWS FOR UMBRELLAS

Windows or portholes for umbrellas have been placed on the market by a concern which believes there is suf-



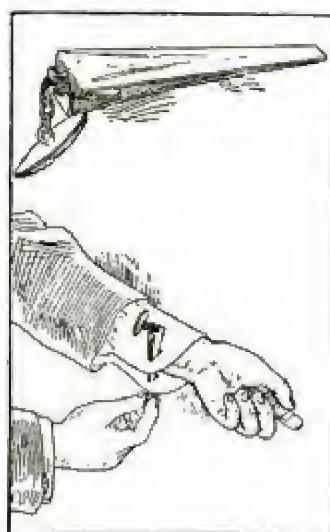
The Umbrella Portholes in Use

ficient reason for such an innovation to make it popular. The windows are of isinglass, and are sold either separate or attached to a new or old umbrella. Their purpose, of course, is to enable the user to see ahead when holding an umbrella as a protection against a driving rain.

A simple transformer, which can be connected to any lamp socket on an alternating-current circuit, has been devised for giving low voltages for operating electrical toys for the enterprising "young hopeful" who is studying electricity. Ten different voltages are provided by this apparatus, and these may be used singly or two or more at a time.

DEVICE INSERTS CUFF LINKS

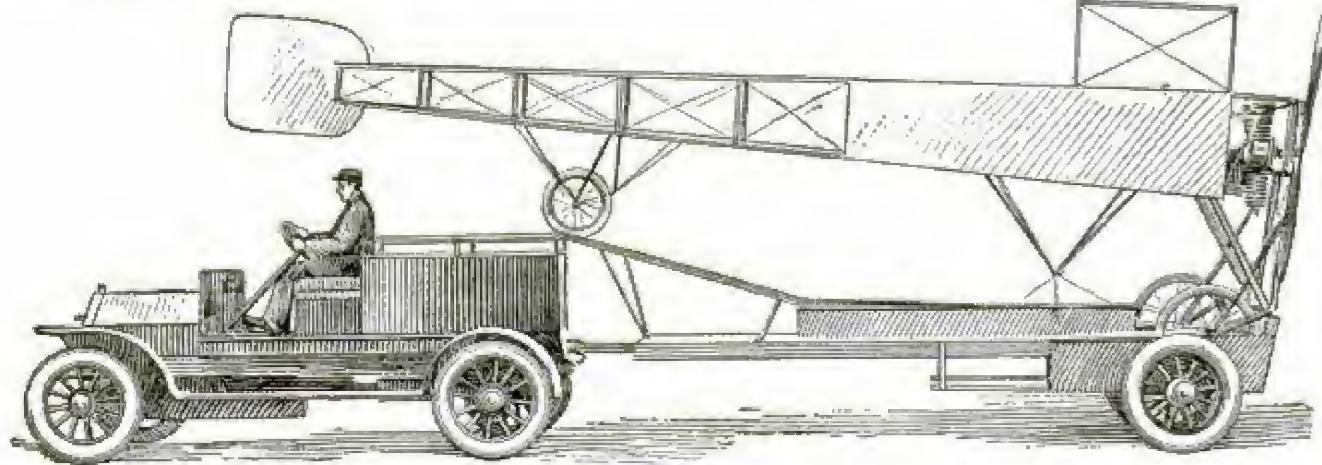
An invention for buttoning the cuff when links are used is shown in the accompanying drawing. One of the buttons is held in one end of the "linker," which is inserted and then pulled through the buttonholes.



In an action recently brought in London, England, for wireless patent infringement, a wireless apparatus was fitted up in the court room and connected to an antenna attached to the flagpole of the building.

AUTO-TRUCKS FOR AEROPLANES

A British automobile concern has built a truck and trailer especially for the transportation of aeroplanes. The body of the auto-truck proper is arranged as three boxes, two long, narrow ones on each side and a larger one in the center, all three being used for the storing of aeroplane parts. The rear end of the trailer runs on two wheels and the forward end is attached by means of a ring to the back of the



Transporting Aeroplanes by Auto-Truck

truck proper. The trailer is so constructed that the aeroplane can be easily run up on it.

VARNISH FOR REFLECTING SURFACES

Metal mirrors, especially those of silver, used as reflectors for searchlights, lighthouses, etc., oxidize very rapidly and must be frequently polished with great care. At each repolishing, however, the reflecting power is lowered, and the operation must be repeated at shorter and shorter intervals.

To remedy this, an inventor has evolved a peculiar varnish, which, adhering to the metal reflectors as a hard, infinitely thin, invisible film, preserves the polish and reflecting power almost indefinitely. The inventor claims the varnish to be absolutely harmless, non-deteriorating and so impervious to water that the surface to which it has been applied can be washed with plain water and dried with chamois without fear of subsequent oxidation.

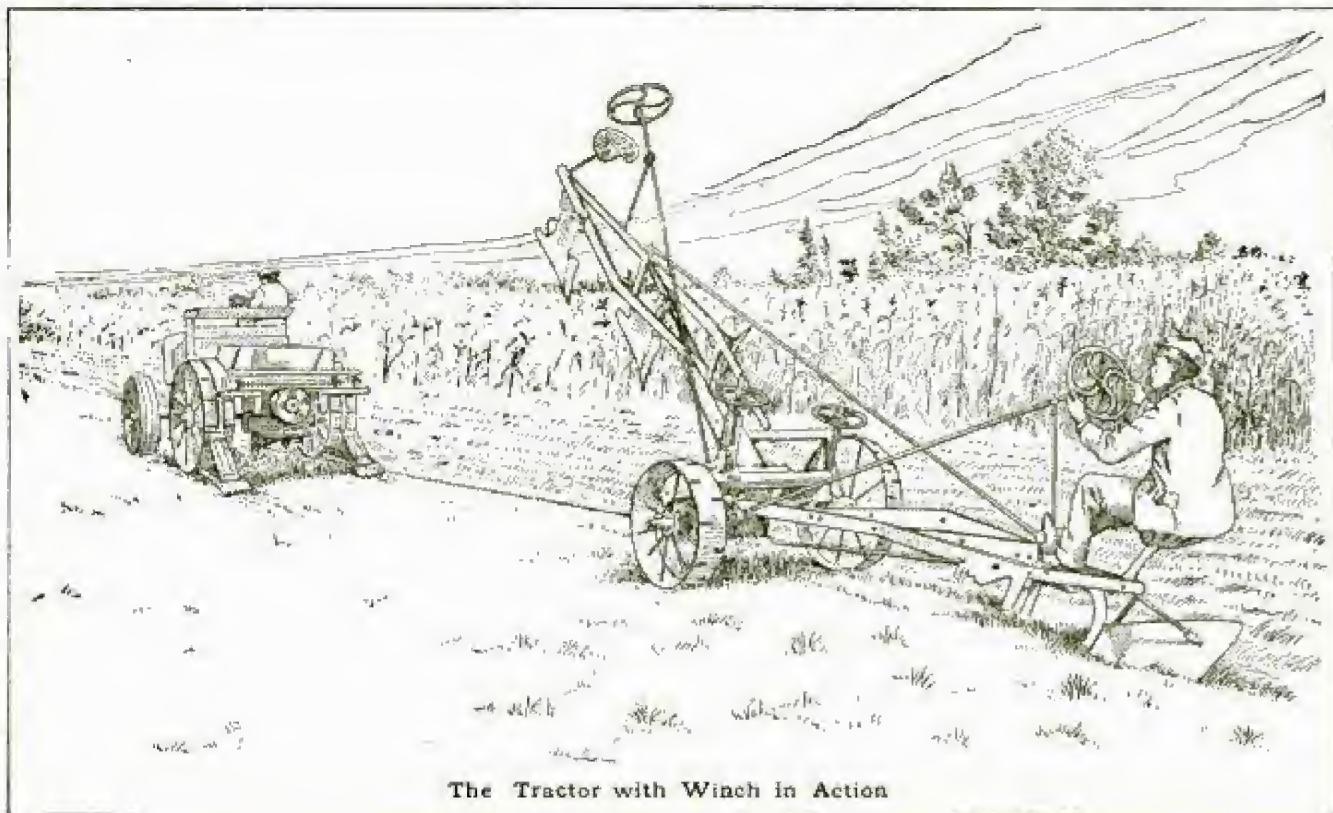
This varnish is applied in the same manner as ordinary varnish, simply taking care that no air bubbles are allowed to form.

A company with a capital of \$10,000,000 and plantations aggregating 450,000 acres has been formed for the purpose of growing cotton in Chosen (Korea).

COMBINED MOTOR TRACTOR AND WINCH

An ingenious combined motor tractor and winch is being used by the French in agricultural work. The machine is

rious double-ended affair. The cable is wound up at a speed of 2 to 3 ft. per second. In heavy plowing, to a depth

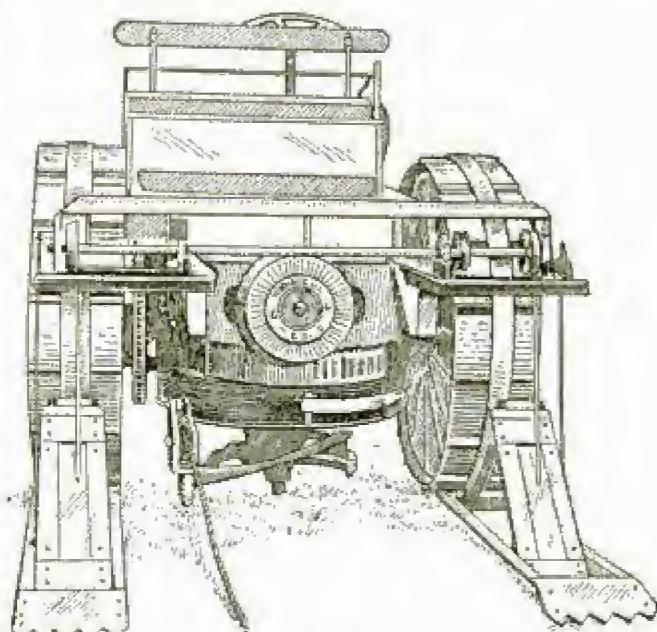


provided with a 25-hp. engine, which drives either the rear wheels, a horizontal winch for pulling a plow or cultivator, or a pulley for the transmission of power to stationary machines.

In tilling the soil, the motor tractor is run forward the length of its cable, at the other end of which is a plow or cultivator. Then the automatically operated braces or spurs provided on the rear wheels are pressed into the ground to prevent the tractor from sliding backward, and the tilling implement is hauled up to the tractor by cable. It is this automatic wedging to the ground that constitutes the main feature of the machine. As long as the engine is thrown onto the rear wheels, the braces are kept suspended by springs, but the moment the tractor stops, they automatically drop down under the wheels and the teeth enter the ground.

One of the illustrations shows the tractor in action. The tilling implement at the end of the cable is a cu-

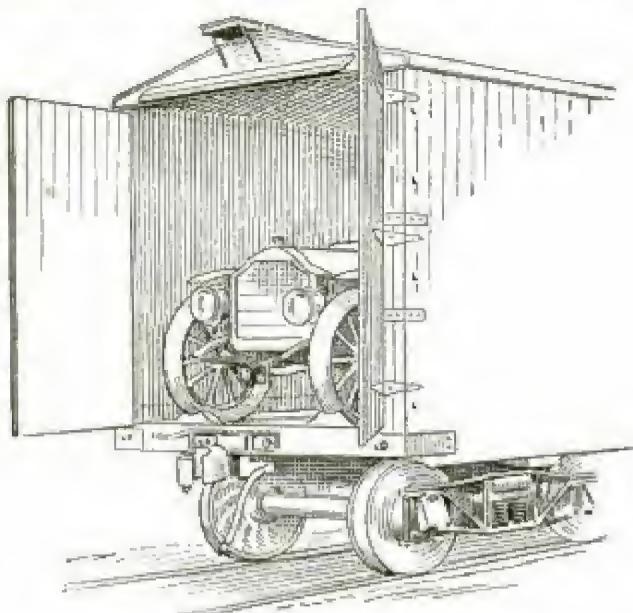
of about 10 in., as many as seven acres have been tilled in 10 hours, the gasoline consumption for this amount of work being about 22 gal. Plowing to a depth of only 6 in., two or three acres have been added to this record.



Braces Used While Hauling with Cable

FREIGHT CAR FOR AUTO TRANSPORTATION

Some time ago a British end-door car for automobile transportation was illustrated in this magazine. This end-

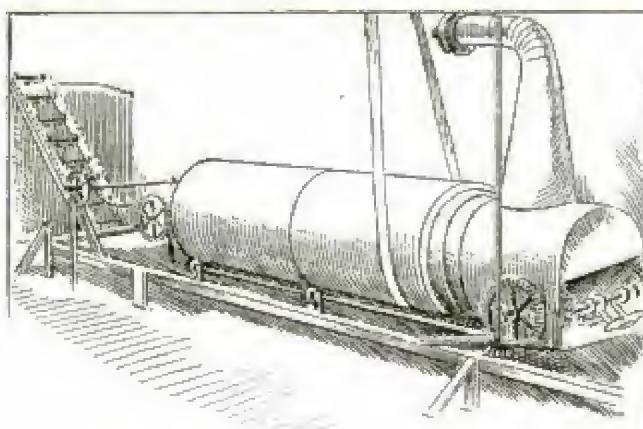


Car for Transporting Automobiles

door car was constructed for the same purpose, and is part of the new rolling stock of the Chicago, Burlington & Quincy Railroad. The length of the car is 40 ft.

MACHINE SCOURS AND DIPS FLAT POTTERY

A machine that supersedes the hand-to-hand method of scouring and dipping plates and other flat pieces of pottery



Machine That Scours and Dips Plates

ter's ware is being used in the domestic potteries at Sebring, Ohio.

The machine comprises a cylinder or drum and glazing reservoir through

which the plates are carried by an endless chain studded with spring clips. An operator feeds the plates to the chain, and as they pass through the cylinder the latter is revolved at a high speed, which causes the sand and other substances to be dashed against the ware, cleaning it in a manner said to be impossible by the hand method. The endless chain with its load of plates drops downward on emerging from the left end of the cylinder and passes through a reservoir containing the glazing liquid. The chain then continues its course and the ware is removed dry and ready for the glost kiln men.

PUMPING WATER 2,200 FEET IN ONE LIFT

A Corliss pumping engine has recently been installed in an American mine, 2,200 ft. below the surface, to pump out the mine water in one straight lift. This may not seem to be anything remarkable, but the enormous "head" of 2,200 ft. introduces some very important engineering considerations. Thus, in this particular instance, the pressure against which the engine has to operate in order just to lift the water this height is 955 lb. per square inch, or between two and three times the pressure of the steam in an ordinary high-pressure steam boiler. The pipes must be designed not only to withstand this enormous pressure, but also to resist the impact or inertia effects of the great column of water when it is suddenly started or stopped. This "water ram," as it is called, may be noted by the very audible rap which occurs when a water faucet is very suddenly turned off.

It is said that the pumping engine noted above is the deepest mine pump in the world.

The Spanish Aero Club of Catalonia is arranging for an aeroplane flight across the Pyrenees between the cities of Perpignan in France and Barcelona in Spain. The maximum height of the Pyrenees on this line is about 3,000 ft.

INSTRUMENTS EXERCISE EYE MUSCLES

Two instruments for correcting discrepancies of sight are shown in the accompanying drawings. One is a bar reading device for forcing binocular vision, and the other, called an amblyoscope, stimulates and exercises the fusion faculty. The former is a bent bar fastened to a head band, the bar being set midway between the eyes. The suppression of either eye at once becomes apparent to the patient because of interference by the rod, thus forcing binocular vision. If both eyes are used simultaneously, the fields overlap and the patient reads behind the bar without difficulty.

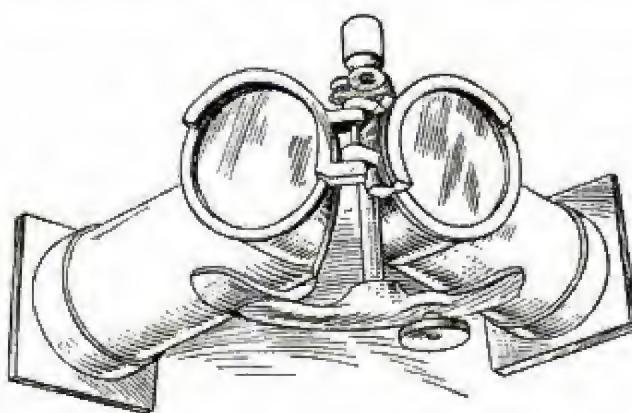
The amblyoscope is the instrument commonly used for the treatment of squint, where education of the fusion sense is desired. It consists of two tubes, each provided with a mirror and joined together by a hinge. Pictures on transparent slides are placed in the grooves at the ends of the tubes and viewed by means of transmitted light. A set of slides, one bearing the picture of a bird, and the other of a cage, is, according to an article on squinting in the Optical Journal, of considerable value because it gives the child the idea of a game devised merely for his amusement. The slide showing the cage is put in the tube before the child's fixing eye, and the screen showing the bird before the squinting eye. The patient is then told what to look for, and

tubes and about 4 ft. distant, and, after the patient has seen the cage, the lamp before the fixing eye is moved further



Bar Forces Binocular Vision

away and the one before the squinting eye drawn nearer. As a result, the child loses sight of the cage but sees the bird. Then the child is allowed to grasp the instrument, and, assisted by the hands of the physician, is taught to vary the angle so as to make the bird go in and out of the cage. After a period of this treatment the eyes often follow the objects and maintain fusion of the pictures.



An Instrument That Stimulates the Fusion Faculty

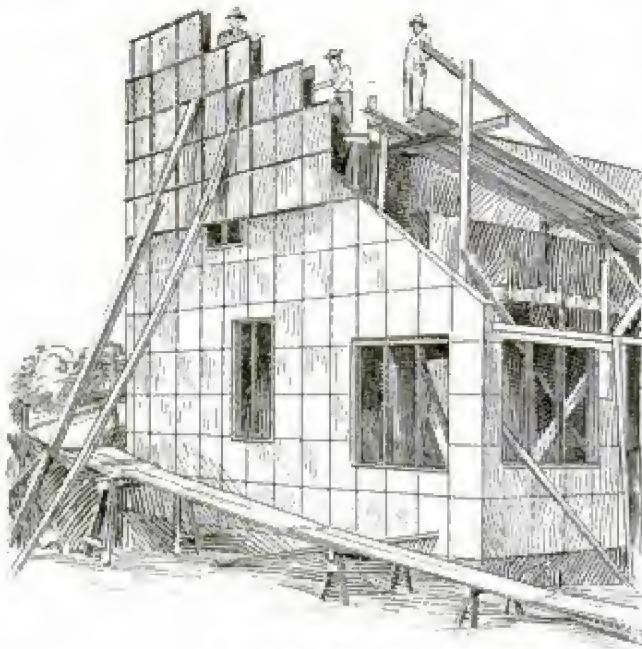
at first sees only the cage. Two electric lamps are arranged in line with the

ELECTRIC APARTMENT HOUSE

A New York apartment house, now in course of construction, will be equipped with a grill, dishwashers, ranges, washing machines, irons, clothes dryers, garbage incinerator and refrigerating plant, all individually operated by electricity. It goes without saying that the lighting is also electric. Gas and coal are not needed at all in the apartments, and it is probable that neither will be used even for minor operations.

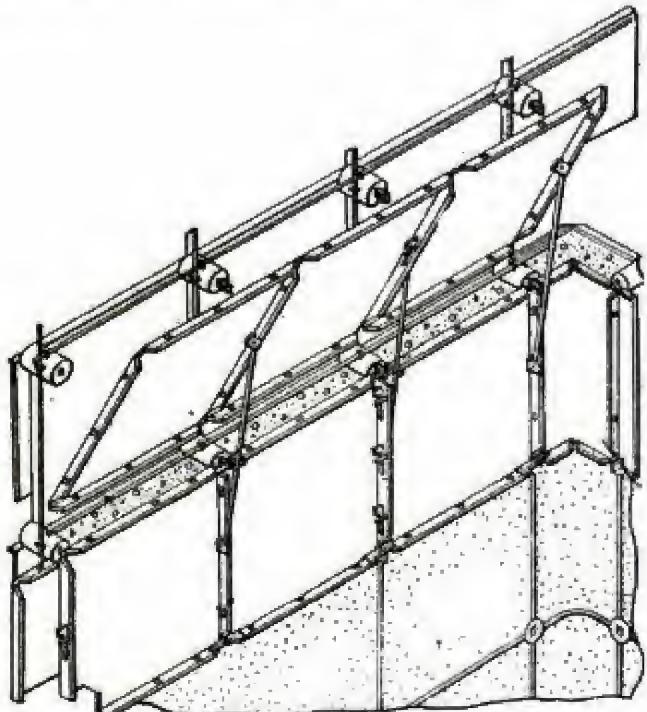
METAL FORMS FOR CONCRETE HOUSES

Several concrete houses at Virginia Highlands, across the Potomac River from Washington, have been con-



Forms in Position

structed with metal molds. The wall forms consisted of panels of No. 12 gauge sheet steel, 24 in. square, flanged



Method of Form Assembling and Bracing

on all sides by a right-angled bend of the sheet. They were used in sets of two tiers each, connected together by light rods. To obtain the required

wall thickness, a pipe or circular spacing block of the proper length was placed between the inside and outside forms at the meeting point of four panels. The entire form has 10 different parts.

Before using, the forms were cleaned and greased. The same forms were also used for the floor construction. Bent panels were used at the corners.

SURFACE, FRAZIL AND ANCHOR ICE

Investigation of the formation and physical properties of the different varieties of river and pond ice, by Prof. H. T. Barnes, of McGill University, Montreal, who has been studying the subject for years, has provided information, much of which is of interest to the public at large.

The position of the first crystals of surface ice is along the surface of the water, but as ice formation proceeds further on account of heat conduction, the crystals become arranged with their principal axes at right angles to the water surface. Previous experiments indicate that an ice crystal conducts heat best in the direction of the principal axis. The difference between "conduction ice" and "conglomerate ice" (ice formed by the freezing together of irregular masses) is great when considered with reference to their power of disintegration. Saltwater ice is a notable example, and the masses of such ice, not being regular in crystalline structure, take an exceptionally long time to melt.

Whenever a river flows too swiftly for surface ice to form into a sheet, it remains disintegrated in small crystals and is carried down by the current. On account of the smallness of these crystals, they have little buoyancy and are easily swept under. This kind of ice is called "frazil," and often becomes very troublesome. It is swept by currents under surface ice formed in the quieter parts of a river

and floats up to the under side, where it freezes together, building down great hanging dams that become as impervious to water as so much rock. The natural river channel is thus restricted, causing winter and spring floods.

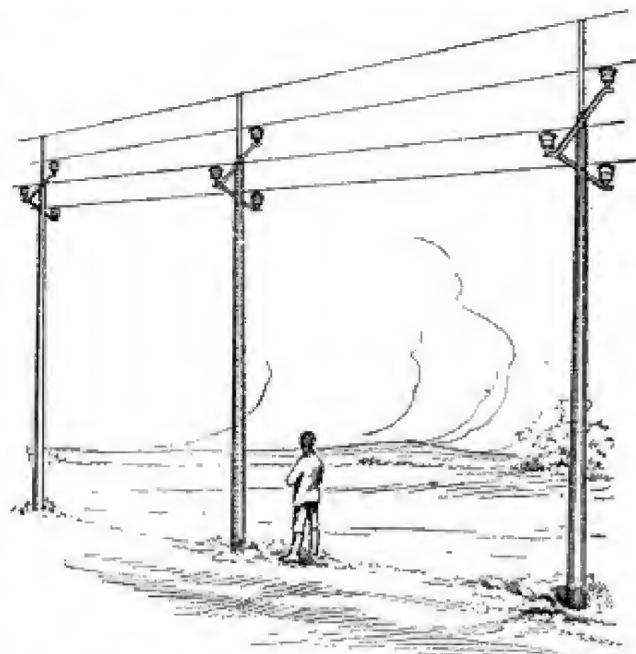
The ice that forms on the bed of a river not frozen over is called "anchor ice" in this country, and "bottom ice" or "ground ice" in Europe. It forms on the surface of objects immersed in water which is slightly supercooled and flowing too fast to freeze over. On clear cold nights it is found growing more rapidly than on cloudy ones, and it also forms faster on dark rocks than on light-colored ones. Terrestrial radiation is therefore responsible for much of the anchor ice, and in addition vast quantities of frazil crystals are frozen to it after having been carried down by the currents. When the water is above the freezing point, anchor ice cannot form, and it has never been observed to form on the bottom under surface ice. Whenever it forms previous to surface ice, it is dislodged as soon as the cover forms, and rises up to become attached to the under side of the surface sheet. The sun exerts a powerful influence against anchor ice. It is a common sight along the St. Lawrence River on a clear cold morning to see great masses rising from the bottom after the sun's rays have penetrated the water.

NOVEL CROSS-ARMS FOR TRANSMISSION POLES

The cross-arms used on the 60,000-volt transmission line connecting Cannon Falls with Mankato, Minn., are of a novel "wishbone" construction which does away with the use of braces or gains, reduces the required height of poles, the number of bolts, and the tree trimming.

The "wishbone" cross-arm consists of two steel angle-sections, bent and bolted together, making an angle of 60 deg. between legs. The ends of the arms are bent into horizontal position, and the insulator pins are bolted to the

flat web surfaces. The arms are bolted to the pole at points two-thirds of the distance from the crotch or single-



Wishbone Form of Cross-Arm Construction

wire side, the moment of the single wire on the long arm balancing the moment of the two wires at the ends of the short arms.

REPAIR LINK FOR CHAINS

To repair a broken chain without the aid of a forge and blacksmith's tools would be difficult were it not for the several kinds of repair links, one of the simplest of which is this patent French link. The two halves of the link are pierced at the middle, and through them is inserted a threaded

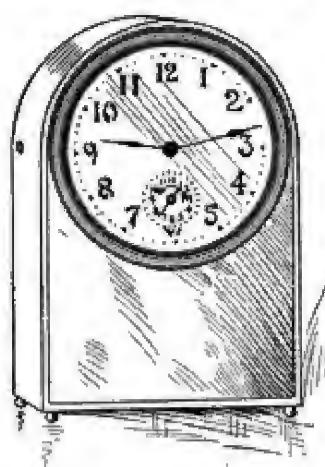


Simplifies Chain Repairing

bolt, around which they pivot. At one end of each half are two pins and at the other end two holes, the pins at the end of one half engaging with the holes in the end of the other.

IMPROVED ALARM CLOCK

The special feature of this alarm clock is its shape, which is a decided



departure from ordinary alarm-clock practice. The common cylindrical case gives way to a shape suggestive of the regular clock, which gives the whole a much richer and more solid

appearance. The alarm repeats every 15 seconds for 12 minutes.

LUNCH CAR FOR THOSE WHO RIDE IN DAY COACHES

The quick lunch on wheels is what the Southern Pacific Railroad Company calls its new form of restaurant cars designed for day-coach travelers who do not care to patronize the expensive diners or risk their digestion in the hurried bolting of meals at the meal stations. The new cars reproduce within the dimensions of an ordinary railroad car the important features of the dairy lunch room of the business districts of large cities. The railroad officials were impelled to provide the patrons of the day coaches and the tourist cars with a more economical way of getting their meals on account of the fact that the dining cars and station restaurants provide facilities for the feeding of but 30 per cent of the people who travel over the road.

The interior arrangement of the car resembles an ordinary city quick-lunch counter. On one side of the car a range has been installed to cook what are known as "short orders," and on shelves built in the car and on the counter that runs almost its entire length, are displayed the eatables usually found in lunch rooms.

In front of the counter are comfortable revolving arm-chairs something like the chairs used in the dining saloons on steamships. The lunch-car experiment is to rest on the results obtained from the two cars the railroad company has designed. It is estimated that this road has 14,000 people to feed daily. The ordinary provision for supplying food to the traveling public barely covers the necessities of the people who ride in the Pullman coaches.

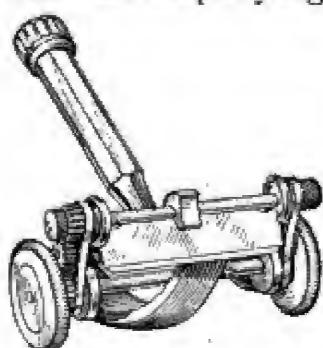
INGENIOUS FRENCH SOP

Sopping up spilled liquids with a sponge or rag is not difficult, but

squeezing it out again with the hands is a task so uncongenial that a French concern has devised a sponge squeezer. The sponge is provided with a handle having a protecting shield. The liquid is squeezed out of the sponge by pressing it against a concave sieve set in the top of the cup, provided as a receiving receptacle.

NOVEL SPIRAL STROPPER FOR SAFETY-RAZOR BLADES

The spiral stropper for safety-razor blades, shown in the accompanying illustration, has recently been put on the market by an American manufacturer. The blade is slipped into a slotted center portion and made rigid, and the device is then run forward and backward on any hard level surface. The stropping leather is secured to the

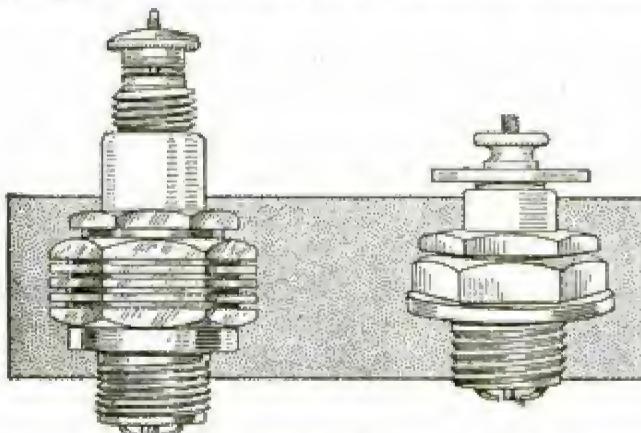


spiral shown in the picture, and the gears cause the blade automatically to reverse as the direction of motion of the stropper is changed. The action of the device gives that drawing motion of the strop over the edge of the blade which is so necessary in putting a fine keen edge on a razor blade.

NOVEL SPARK PLUGS FOR EXPLOSION ENGINES

An air-cooled spark plug, for air-cooled internal-combustion engines, is a recent invention. Cooling is accomplished by means of flanges which are molded on to the body of the plug.

A "dumpy" plug, used where long plugs are undesirable for constructional



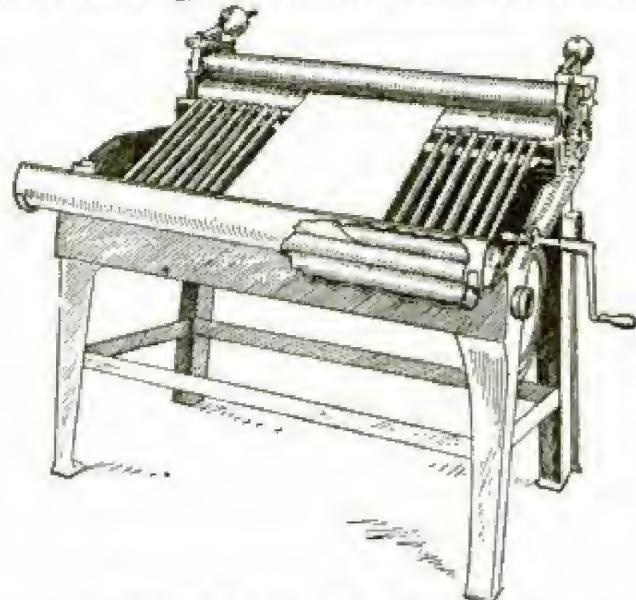
Air-Cooled Plug and "Dumpy" Plug

reasons in certain designs of engines, has been recently introduced by an English firm. The full height from the base of the thread to the top of the terminal is but an inch. The plug is especially useful on engines where the tank comes low down over the valve caps.

MACHINE MAKES OPAQUE PAPER TRANSPARENT

A machine that makes possible the production of blueprints without the necessity of making tracings of original pencil or pen drawings, is shown in the accompanying illustration. The machine is composed of a series of electrically warmed rolls; a chemical bath, also electrically warmed; a series of traveling tapes and a pair of rolls for drying purposes.

The operation consists of turning on the electric current, which warms the rolls and bath; inserting the drawings and turning the crank which runs the



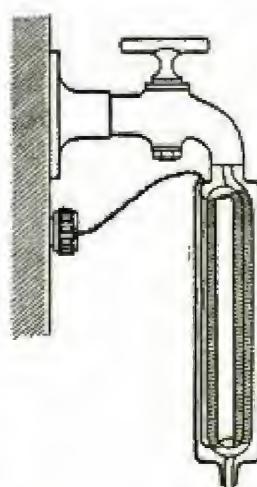
Preparing Drawings for Blueprinting

drawings through the rolls. As the paper passes through them, the chemical is pressed into it and it is then conveyed by traveling tapes to the drier rolls, where the surplus chemical is absorbed.

It is claimed that the machine makes any white paper, no matter how heavy or opaque, sufficiently transparent to blueprint through quickly.

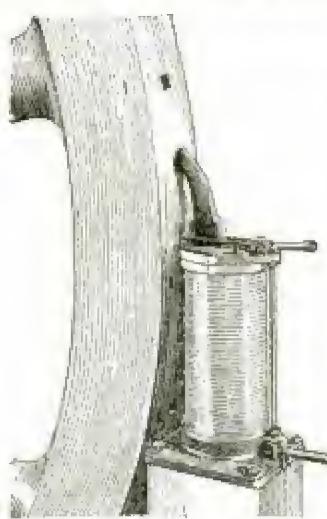
ELECTRIC HEATER ATTACHED TO FAUCET

A French instantaneous water heater for direct attachment to the faucet is shown in this drawing. It consists of a brass tube containing a coiled glass tube wound with fine nickel-steel wire. The water is heated while passing through this tube, which projects through the lower end of the protecting brass tube. Connection with the electric current is by means of a flexible wire.



A NOVEL ENGINE JACK

A novel adaptation of a jack for turning or "barring over" a heavy fly-



wheel is shown in the accompanying illustration. This jack may be operated with either steam or compressed air, and will turn the fly wheel quite rapidly through any angle required, or as slowly as

desired through distances down to as little as $\frac{1}{8}$ in., thus saving time and labor as well as the patience of the engineer.

For turning over an engine, as for checking or setting valves and valve gears, trying clearance, taking up connecting-rod bearings or the like, as well as for making an examination of the rotating parts of dynamos and motors, this little jack would prove useful. Although developed originally for use with Corliss and blowing engines, its range is limited only by the ingenuity of the person using it.

FRANCE FIXES WEIGHT OF THE CARAT

The weight of the carat in France will, in the future, be 200 milligrams (3.0864 grains), a ruling on this matter having been made in response to appeals from jewelers throughout the world. It is expected that this weight will be adopted by all countries. Heretofore there has been much confusion resulting from the variation in different countries in the exact weight of the carat. As everyone knows, this is the term employed to designate the unit of mass in precious stones and gold. The variations have been slight, but the weights of many stones are slight, so that the difference of a

fraction of a milligram made quite a substantial difference in the prices of those articles which usually are sold by their weight. The need of the change is found in the fact that while a carat weighed 205.1 milligrams (3.1651 grains) in Amsterdam, where it was lightest, it was officially rated at 207 milligrams (3.1944 grains) in Venice, where it was heaviest.

CLEAN YOUR SILVERWARE BY ELECTRICITY

Cleaning the silverware once a week is one of the disagreeable duties of the industrious housewife. The ordinary method employing polishing paste and "elbow grease" is laborious and also injurious to the ware, as every time a certain amount of silver is removed in the operation. The up-to-date housewife, therefore, will readily appreciate the advantages of a simple electrical process which not only obviates the necessity for manual exertion but also removes the tarnish without the loss of even a particle of the precious metal.

The apparatus consists of a pan made of sheet zinc, with a wire grat-



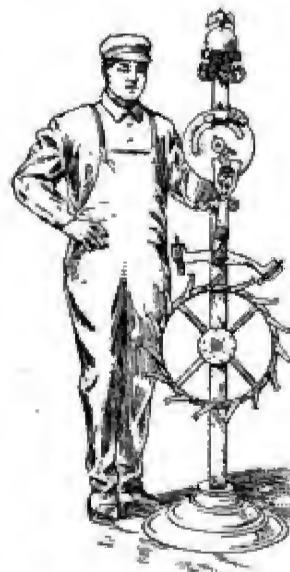
Silver-Cleaning Apparatus

ing of another metal, preferably tin, attached to the bottom by solder, substantially as shown in the illustration. The solution used in the pan may be made in any kitchen, for it comprises only ordinary baking soda and table salt dissolved in hot water. No ex-

ternal source of electricity is needed, as the dissimilar metals of the apparatus set up a feeble electric current which removes the tarnish by taking away from it everything but the silver which is left as a bright deposit on the ware. The apparatus is the patented invention of two University of Wisconsin engineers, and is already being used to a considerable extent.

MODEL SHOWS WATCH ESCAPEMENT

With the aid of this huge escape-
ment model, standing over 6 ft. high



and composed of over 300 pieces, students in a watchmaking school grasp and master the laws governing the escapement action of a watch. The model amplifies the escapement about 100 times, the escapement wheel being more than 2 ft. in diameter, with the pallet stones, pallet,

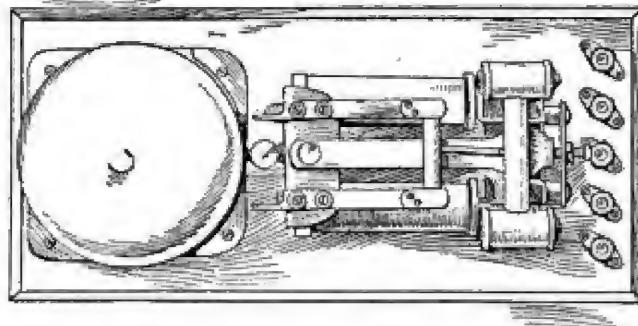
fork and roller tables, both double and single, designed in proportion.

SWITCH GIVES CONTROL OF SUBSTATION LINES

A switch which, placed on a pole or in a farm house, will give remote control of substation lines to the operator at the regular office, may, according to "Telephony," revolutionize the rural telephone business.

Among the advantages the new switch makes possible is the extension of a party line without overburdening it. For instance, if five or six miles more of wire and seven or eight additional stations to a 15-party line are joined up, under the present system, many difficulties present themselves.

But by the use of this switch, these additional stations are connected to the main line or the exchange only

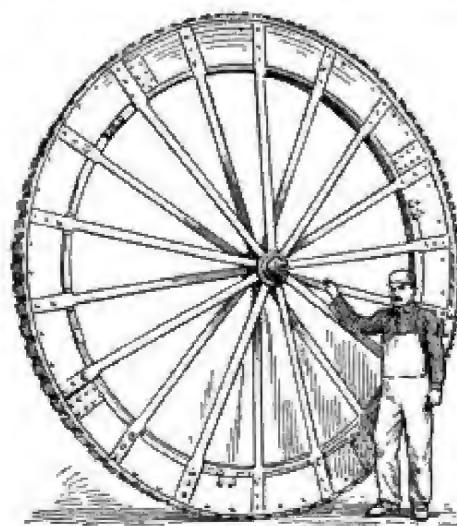


Switch That May Revolutionize Rural Telephone Business

when one of them desires to talk beyond his own little territory. And in addition to this advantage, the switch can be used for instantly connecting two farmers' lines, extending across country toward each other from two different exchanges, into a toll circuit whenever subscribers in either exchange wish to talk across. Normally, each circuit is kept separate.

AGRICULTURAL TRACTOR HAS 12-FOOT WHEELS

The largest wheels ever used on an agricultural traction engine were built by a firm in Leeds, England, for ex-

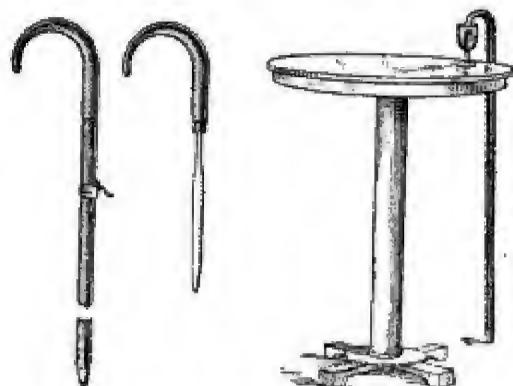


One of the Large Tractor Wheels of English Tractor

perimental purposes. The giant wheels are 12 ft. in diameter, with a bearing surface 18 in. wide. The wheels were designed for use on soft soil.

CANE AS A PREVENTIVE OF INTOXICATION

According to a French authority, this remarkable drinking cane is designed especially for those who find it



Cane That Drinks When Owner is Indisposed

necessary to seem to drink heartily of intoxicants for reasons of sociability. But it may also be found serviceable for the person who has imbibed to satiety and wishes surreptitiously to provide something for the morning.

The handle is perforated at the end, and running through both handle and stick is a rubber tubing, forming a siphon. By raising and lowering the lever shown part way down the cane air is expelled and the siphon begins to act, rapidly emptying the glass. The capacity of the cane is several glasses. It may be relieved of its contents by giving the screw-tip a few turns.

The French concern advertising the cane recommends it to relieve drummers and others of part, at least, of the heavy drinking, which is incident upon their business visits.

CONSERVATION IN AMERICAN OIL FIELDS

The conservation wave has reached the American oil fields. Too many wells have been abandoned before being exhausted. The trouble has been that the heavy paraffins have congealed and sealed up the pores in the oil-bearing strata. Two methods of removing this paraffin have been proposed, and in both the agency is heat. In one method, the heated exhaust gases from a special kind of internal-

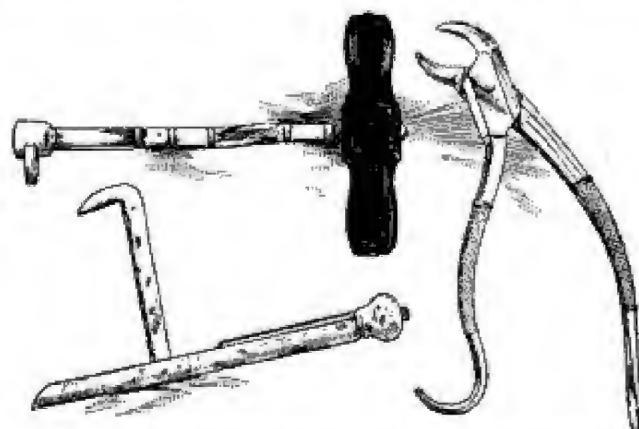
combustion engine are used to melt the wax and renew the flow of the oil. In the other, an electric heater and pump are used. The ultimate object, however, is the same in both cases, to conserve the supply of natural oils, if it can be done—profitably.

MAY CROSS MEDITERRANEAN IN AEROPLANE

The possibility of crossing the Mediterranean in an aeroplane from Marseilles to Algiers, a distance of about 500 miles, is being seriously considered in France. The flight would not be sustained, but would include a landing on one of the Balearic Islands, which are about midway. Tabuteau's record of about 290 miles, covered in a trifle over six hours of uninterrupted flight, furnishes the basis for the calculations.

EVOLUTION OF THE TOOTH EXTRACTOR

The evolution of the dentists' most feared tool, from the crude implement of centuries ago to one of the many types of extractors of modern dentistry, is here shown. The implement at the left is a cant hook with which dentists of the sixteenth century pried loose the teeth of what might well be designated the victim. The implement in the center is a turn-key type used



Cant-Hook Extractor of Sixteenth Century—Turn-Key Extractor of a Hundred Years Ago—Scientific Modern Forceps

during the early years of the last century, while the remaining one is typical of the scientific forceps of today.

SAND-BLAST BARREL FOR SMALL CASTINGS

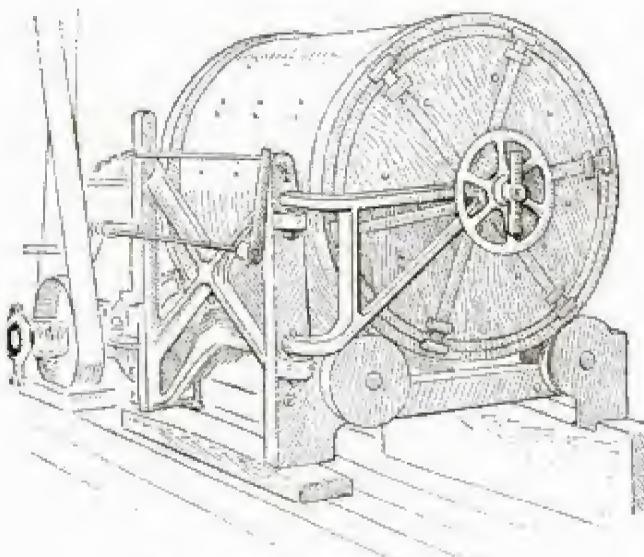
A sand-blast tumbling barrel which will clean a large number of small cast-iron or brass castings at one charge has been placed on the market by a New Haven, Conn., concern. With the ordinary form of sand-blast, it has been necessary to handle each casting separately, which has made the process, especially with cheap cast-iron goods, too expensive.

The outer shell of the barrel is made of cast-iron, and the inner is of perforated sheet steel. Between this lining and the outer shell are a series of

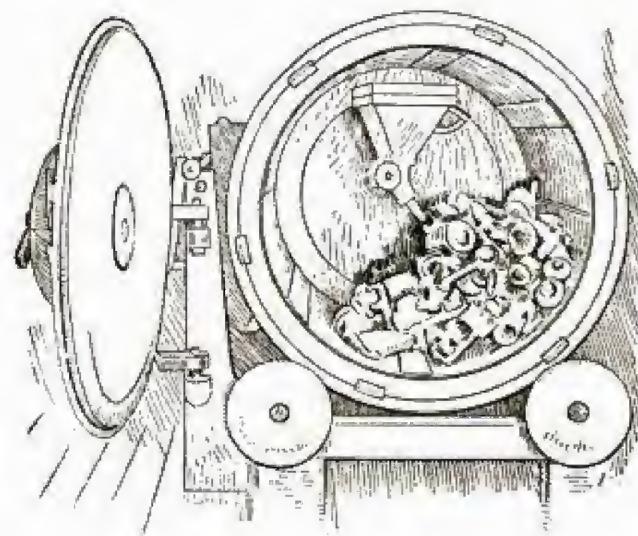
tem prevents dust or sand from escaping.

The time required for each charge varies with the nature of the castings being blasted. One of the illustrations shows a charge of food-choppers, every portion of which, inside and out, was cleaned in 20 min. Ordinary small hardware castings have been finished in five minutes.

The barrel rests upon roller bearings, and is revolved slowly, as all that is required is to bring every portion under the blast.



Exterior of Sand-Blast Barrel



Interior, with a Charge of Food-Choppers

buckets, which, with the hopper, form the important features of the barrel.

In beginning the operation, two or three shovels of sand are thrown on top of the articles to be blasted, then the door is closed, the barrel started revolving, and the blast turned on. The sand, blown among the tumbling castings, drops through the perforations of the inner lining, and is picked up, elevated, and dropped into the hopper. It then falls from the hopper into the air-blast issuing from the four nozzles arranged in a row at the bottom of the hopper, thus forming the sand-blast.

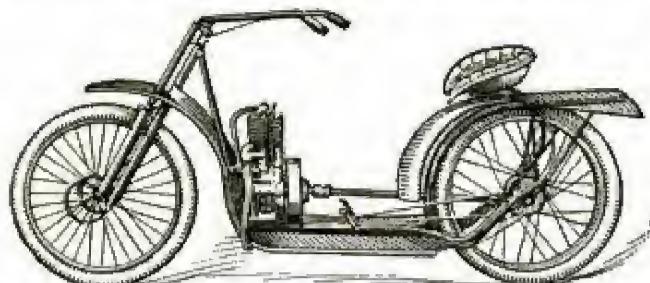
The blast has a pressure of about 50 lb. per square inch, and the sand is used over and over again, the buckets continually elevating and feeding it to the blast. An ingenious exhaust sys-

TWENTY YEARS OF RAILROAD DEVELOPMENT

In twenty years, the miles of line in this country have increased 52.7 per cent; the miles of track, 73.5 per cent; the net capital, 63.3 per cent; the number of passengers carried, 86.5 per cent; the number of locomotives, 97 per cent; the number of employes, 116.2 per cent; the number of freight cars, 154.6 per cent; the wages of employes, 157.4 per cent; and the number of tons of freight carried, 175.3 per cent. A recent estimate gave the net capital of railroads in the United States as \$14,000,000,000—14 billions of dollars—and the number of tons of freight carried per year as 1,500,000,000.

BRITISH MOTORCYCLE IDEAS FOR 1911

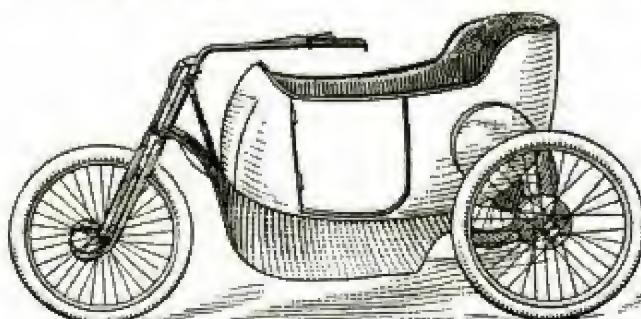
Many striking novelties in motorcycle ideas appeared at the recent show in London, several of which are shown in the accompanying illustrations.



Motorcycle with Bucket Seat, Shaft and Worm Drive, and Pressed Steel Frame

The motorcycle provided with shaft and worm drive has many features. The frame is of pressed steel, and is supplemented by light tubular extensions, which support the footboards and front guards. The 4-hp. engine is set athwart the frame, with the magneto placed on one side and the carburetor on the other. The flywheel is on the same side as the shaft. The novel feature of the drive, a shaft with a universal joint, is the worm and worm wheel employed. The worm is underneath, so that it obtains thorough lubrication. The seat is of the aluminum pan type and is well upholstered. An aluminum gasoline tank is curved to form the forward portion of the rear mudguard.

The motor-tricycle, which is made by the same concern, is provided with a frame similar to the one described, the only exception being that the tubu-

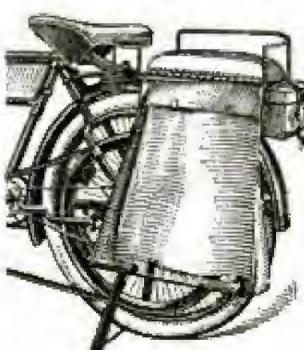


Motor-Tricycle Novelty

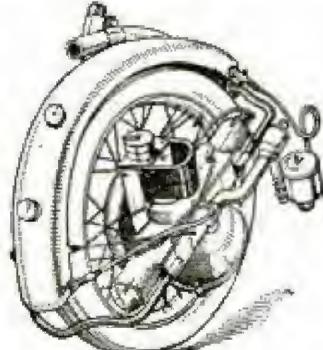
lar extensions are spread at the rear to stay the driving axle. The steering is by a tiller. The body is of the automobile type, well upholstered,

with side doors. The back of the body is high.

An ingenious little power plant attached to the wheel it drives has been designed to convert the ordinary bicycle into a power-driven machine. This model made its appearance last year, but was almost immediately withdrawn for modification, so that the cost of production could be reduced sufficiently to make the attachment practical. The illustration shows the modified design. The engine is of the two-cylinder, horizontal-opposed type. The magneto is placed above the engine, with its armature vertical. The location of the carburetor is clearly shown. The method of attachment is



Passenger Seat for Women



Power-Driven Wheel for Bicycles

by a double-knuckle joint. The drive to the wheel is through a reduction gear, a jaw clutch and a bevel. The weight of the wheel and motor, which is substituted for the ordinary bicycle wheel, is but 30 lb. The mudguard is in the form of a tank, containing the gasoline and lubricating oil.

Among the devices for carrying a passenger on the rear carrier of a motorcycle was a padded side-seat for women. A brass rail is provided as a back support. A double rest accommodates the feet, and a leather shield prevents the dress from coming into contact with the wheel.

Shipbuilders of the United States are to construct the two large cruisers which the Cuban congress has ordered for the navy of the island republic.

WOMEN COMPETING FOR AERIAL HONORS



Mlle. Dutrieu, Who Holds the Duration Flight Record for Women



Mlle. Marvingt

France has a number of aviation enthusiasts among the fair sex and recently several records were established by feminine operators. Mlle. Marvingt set the pace for her sisters in aeroplane flying by remaining in the air 53 min. in her Antoinette monoplane at Mourmelon during a heavy gale and while the weather was intensely cold. It was thought she had won the duration prize offered women



Mrs. Bessica Raiche, First American Airwoman

by a French women's journal, but her feat simply served to inspire others to similar attempts. A day or two later Mlle. Dutrieu, in a Farman biplane, remained in the air 1 hr. 9 min., covering 60.8 kilometers (37½ miles).

America has its airwomen also.

Only recently the Aeronautic Society awarded a medal to Mrs. Bessica Raiche, the first woman aeroplane pilot in America.

ELECTRICAL LABORATORY FOR THE PUBLIC

AN electrical laboratory for the education and use of the general public has been founded in Brussels by Prof. R. Goldschmidt, who realizes the difficulty of acquiring an exact understanding of an experiment except by making the experiment personally.

His idea, therefore, in founding the laboratory, was to provide the public with means of becoming familiar with the phenomena and applications of electricity. At first, he had in mind the

organization of a sort of museum of electrical inventions and discoveries, something on the order of arts and crafts or industrial museums; but the limitations of such an institution soon became clear to him. What, in his opinion, needed demonstration was not the manner of making an experiment, but the experiment itself. Consequently, the dominant feature of the laboratory is the provision of means by which the visitor can, without the aid of a teacher,

master the experiments. This is done by confronting him at the same time with the problem and its solution.

The main difficulty was the devising of the experimental apparatus, and in this Professor Goldschmidt proved himself an inventor as well as a scientist. He has conceived and constructed most of the apparatus to the smallest detail with a view to their simplicity, solidity and reliability.

On the ground floor of the laboratory is installed equipment for fundamental experiments, which require no complicated apparatus. The public is first introduced to the natural magnetic stone, then to the properties of magnets and electro-magnets. Then follows the explanation of electric motors, and from the familiar electrifying of glass or wax by rubbing, the student proceeds to the action of the Wimshurst machine, which, in its effect, is equivalent to the induction coil, studied in another section. In this department the phenomena of electric discharges through different mediums (cathode rays, radioactivity, etc.) are studied.

On the next floor are found apparatus serving to demonstrate the theoretic principles of electricity, and for the study of induction, alternating currents, and the methods of measuring electric forces.

In the above mentioned sections, each apparatus is enclosed in a glass cage, so that the experimenter can only touch the parts necessary to start and conduct an experiment. To do this, he has only to follow the instructions in a booklet or guide, which is given him as soon as he enters the laboratory. Instructions are also hung up in front of each apparatus.

If, for instance, the experimenter wishes to demonstrate the difference in conductivity of a metal wire at different temperatures, or, in other words, the influence of heat on the resistance of conductors, he goes to the apparatus reserved for this experiment, and presses a button. This action makes a little bell ring, and then he presses a lever, which lights a flame that slowly heats a spiral of steel wire connecting

the bell with the battery that actuates it. As the wire becomes hotter, the ringing of the bell grows weaker. By means of another lever, the experimenter may introduce into the current and under the flame a coil of nickeline or a filament of metallic oxide, thus demonstrating that the resistance of nickeline is not influenced by heat, while in the filament the resistance diminishes as the temperature rises. The same simple and practical methods are followed in all the experiments in the two sections just described. The visitor can, alone and unassisted, except for the guide book, which covers over 300 experiments, study the phenomena which interest him.

INTERNATIONAL DIRECTORY OF FOREIGN COMMERCE

The Bureau of Manufactures of the Department of Commerce and Labor announces, after four years of investigation and compilation, the completion of an international trade and business directory that contains the names and addresses of 125,000 commercial concerns in foreign countries engaged in foreign trade. The names are classified according to the nature of the business, the city, and the country, and represent the result of careful investigation by consular officers and special commercial agents of the government. The officials in charge of the book do not claim to have secured the names of all of the foreign firms engaged in the various branches of trade, but they do believe they have compiled a representative list. The book is printed on stout paper and is substantially bound. It will be for sale in the same way that other public documents are sold, through the Superintendent of Public Documents. No copies have been printed for free distribution.

¶In England a medical man may obtain a license for his automobile at a reduced rate, but if he does he cannot carry a passenger, except a chauffeur.

BUREAU OF CLASSIFICATION FOR AERIAL CRAFT

Basil Zaharoff, the engineer who endowed a chair of aerial locomotion at the Sorbonne, Paris, has now donated \$10,000 for the establishment of an aerial bureau of classification. Its purpose is for the listing of both heavier-than-air and lighter-than-air machines, and especially for their classification from the point of view of safety. The classification is to be periodically revised, and will provide a means by which all who contemplate aerial flight may receive unprejudiced information as to the degrees of chance taken in using the different types of machine.

DELIVERING OIL IN RURAL PORTUGAL

Americans have grown so used to seeing everyday commodities handled and transported in bulk for economy's sake that primitive methods in the civilized but older and slower countries of Europe are curiosities to all but the experienced traveler. Even in London it is possible to see the milk retailer carry his milk in a couple of cans hanging from a yoke about his shoulders. The illustration shows the

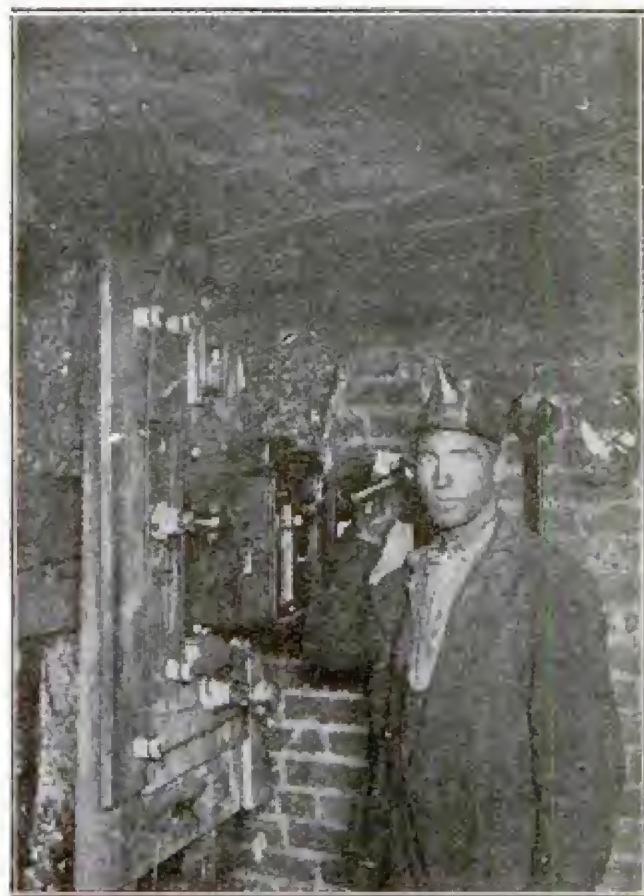


Oil Delivery in Rural Portugal

method commonly used in rural Portugal for distributing kerosene oil from door to door.

AN IRONCLAD TELEPHONE FOR COAL MINES

The telephone instrument shown herewith is specially designed for use in mines and is proof against moisture,



A Telephone 12,000 Feet from Daylight

gases, fumes and even explosions, any of which would soon put the ordinary commercial telephone out of commission. The inner parts of the instrument are protected by two iron doors, only one of which is opened when the wire is being used.

Mine telephones are used not only for transacting business from instructions given at the surface, but also for locating blazes in the mine, calling medical assistance, etc. Disasters like that at the Cherry mine would be impossible if telephones were installed in mines, and this fact is fast being recognized by the state legislative bodies.

The photograph from which the accompanying illustration was made was taken by flashlight some 12,000 ft. from the surface down a four-per-cent grade in a Pennsylvania mine.

GARTER STILETTO WOMAN'S NEWEST PROTECTOR

Deprived of pockets in which she might carry firearms, and public senti-



The New Garter Stiletto, Snugly Sheathed, but Always Ready for Use

ment imposing on her the use of more subtle weapons than a club or sword stick, which she would find hard to conceal, modern invention has added

another weapon to the hatpin for women of fashion. The device is the garter stiletto, a long, sharp, vicious weapon that fits snugly in a sheath attached to the garter. The slender steel blade is so thin and so narrow that it would not attract more attention than a hatpin and could be wielded with more deadly effect, in case of necessity.

SHORTENING THE TRANS-SIBERIAN RAILROAD

The many improvements being made and about to be made on the trans-Siberian railroad will place this line in first-rate condition for heavier traffic and shorten the route considerably. Steep grades and sharp curves are being reduced, and one section has been shortened 99 miles by complete rebuilding. A 994-mile road, on which work has already commenced, will connect Pekin with the trans-Siberian road at a point south of Lake Baikal. When this line is finished, the distance between Paris and Pekin will be but 6,307 miles, instead of the 7,456 miles by way of Karbin and Mukden. The journey will take 9½ days, instead of 14 days, as at present.

MOVING PICTURES MADE OUTDOORS AT NIGHT

It has been left to the enterprise of a body of men eager to advertise their city to overcome the darkness of night as an obstacle to the making of motion pictures. Those who viewed moving pictures of the "Priests of Pallas" night parade held in Kansas City, Mo., last year, in their appreciation of the beautiful floats, doubtless overlooked the extreme difficulties that were overcome in preparing them for the screen. Moving pictures made at night mark a wonderful advance in the photographic art. It has been comparatively easy, after the sun has set, to make photographs by the use of flash-light apparatus, but in all such

photography, the subjects must remain still, and, as a rule, the results are not perfect by any means. The production of artificial light of sufficient power to cause the perfect imprint of the image on the sensitized plate is not new, but the making of a perfect moving picture which shows a number of objects in every detail is distinctly new.

The enterprising men in charge of the Kansas City festival wanted pictures of the parade and appealed to a moving-picture man to make them. He cogitated over the subject many weeks and finally agreed. To accomplish his purpose he erected a platform



One of the Floats in the Kansas City "Priests of Pallas" Parade Photographed at Night



Arrangement of Light by Which Moving Pictures were Made at Night

about 20 ft. high on one side of a street through which the parade was to pass. On this were strung 60 arc lamps in two rows, backed by a monster sheet-tin reflector. The reflector was 70 ft. long and 6 ft. high. On the opposite side of the street was another embankment of light almost as powerful, so that for a distance of about 100 ft. the street was brilliantly illuminated. The machines were started as soon as darkness settled over the city and a film 600 ft. long was made of the parade. The results were highly satis-

factory, the film showing clearly every feature of the parade.

But moving pictures were not all that resulted from the light arrangement. The newspapers of Kansas City sent their photographers to the scene and the next day every paper in the city had snapshots of the night parade that were as good as similar pictures made in daylight. The cinematograph film depicting the parade is private property, but efforts are being made to have it shown in motion-picture theaters throughout the country.

RACK THAT DISPLAYS AND STORES MAGAZINES

A magazine display rack has lately been put on the market that is regarded by newsdealers as supplying



New Magazine Rack for Newsdealers

a need that has hitherto baffled their ingenuity. By means of this rack from 50 to 70 different publications can be displayed in compact form. The racks are of different sizes, but even the largest is not too bulky for the small store.

or news stand. The stands are really a series of shelves with partitions the size of magazines. Across each section of shelves is run a rod of oxidized steel and each of the pockets made by the partitions will hold from 15 to 25 magazines. The steel rod across the sections holds the magazines upright in the pocket, and at the same time permits the display of the entire cover. When one copy is sold another takes its place at the front of the section automatically. The racks that have so far been made have been equipped with pockets the size of the standard magazines, 12 in. by 16 in. and other pockets for the larger publications. The racks are mounted on rollers and can be readily moved.

RECORD LIFE OF ELECTRIC-SIGN LAMPS

An electric sign installed in Minneapolis on Feb. 2, 1909, has 154 lamps, out of which only one has had to be replaced up to the present time, thus giving the remaining 153 lamps an effective life, up to date, of 3,500 hours each, with the probability yet of materially improving this record performance. The electric lamps are low-voltage tungstens, and their ruggedness is further emphasized by the fact that, during a recent repainting of the sign, all of the lamps were removed and replaced by the workmen without a single breakage.

NEW SAFETY DEVICE FOR RAILROADS

A Boston man has invented a device called a "metregraph" which combines with the usual electric block-signal system for railroads a series of torches, attached to telegraph poles between stations, which are set on fire ahead of the train when the engineer ignores or overlooks danger signals.

MAKING A PIANO MOVER OF AN ORDINARY AUTO

There have been many combinations of business and pleasure in the operation of an automobile, but few motorists have been able to transport such unwieldly articles as pianos with ordinary touring cars. An enterprising Nebraska man has accomplished this feat. Being a devotee of motoring, and owning a piano establishment which supplied instruments to patrons living at a distance from his place of business, this ingenious merchant devised a two-wheeled truck substantial enough to convey a piano. A long tongue connects the truck to the rear of his automobile. The piano is bound securely to the truck in an upright position. The owner of this unique device has frequently transported pianos far into the country without the slightest difficulty.

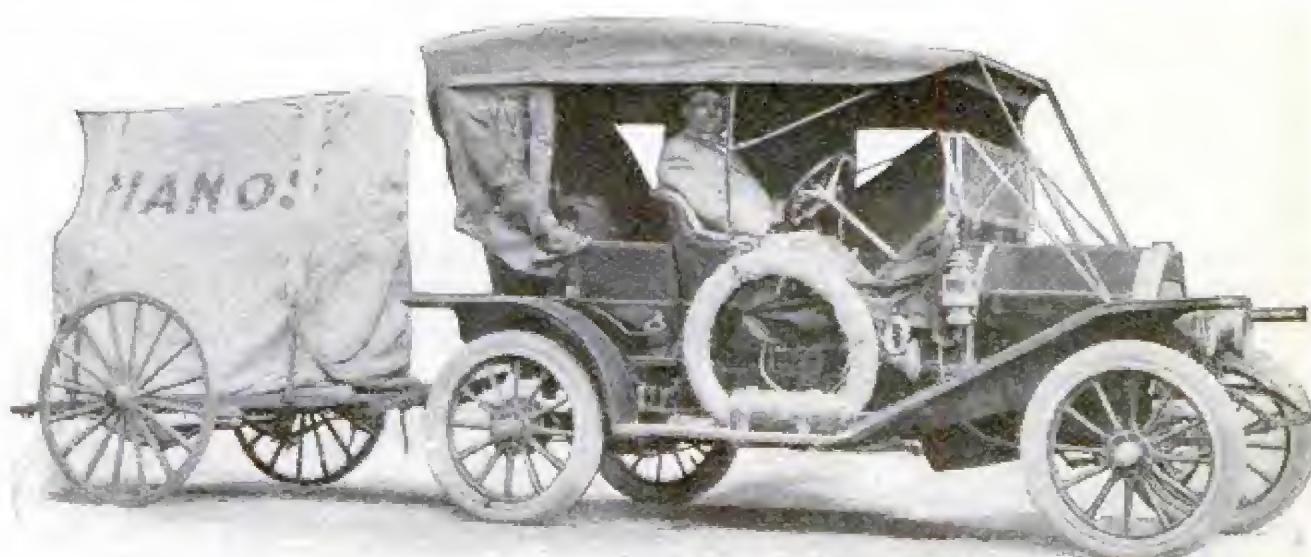
NETWORK OF LIGHTNING FLASHES

One of the most remarkable discharges of lightning ever photographed was recorded by the camera in Win-



Remarkable Photograph of Lightning Made at Winnipeg, Canada

nipeg, Canada, during an unusually heavy electric storm. The picture shows more than a dozen flashes, all of which occurred at once in different sections of the sky. Some of these flashes showed very faintly in the photograph and others were especially vivid. The storm was one of the most severe ever experienced in Canada.



Unique Manner of Moving Pianos with an Automobile

THE MAKING OF ARTS-CRAFTS LAMPS

By JOHN D. ADAMS

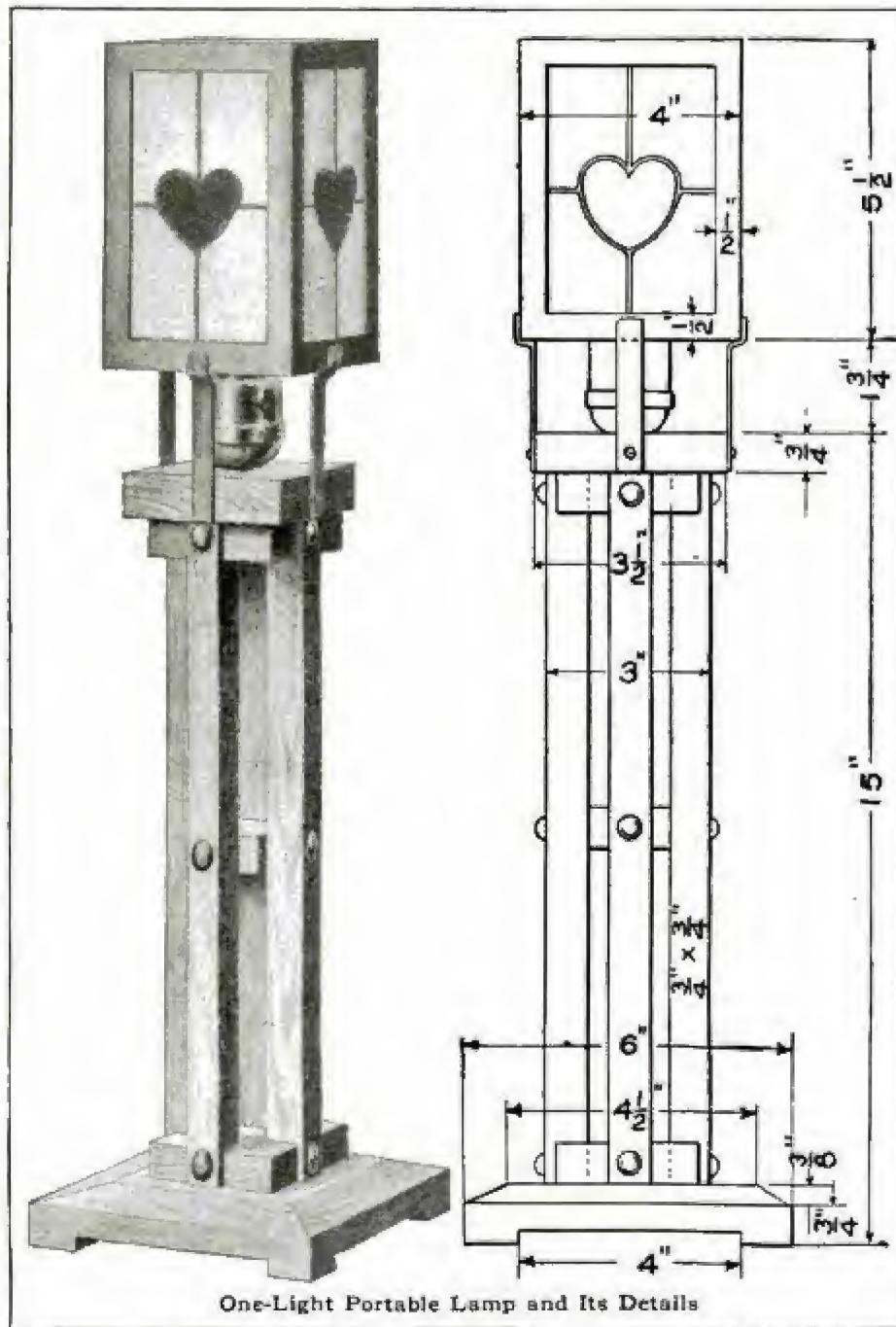
PART VIII—ONE-LIGHT PORTABLE

THE construction of the shade for this little portable lamp is so simple that it is hardly necessary to give any pattern for the cardboard frame.

tened where they overlap at the corners with paper fasteners. This form of construction, when properly carried out, gives the shade the rigidity of a cardboard box. While the simple pattern shown may savour somewhat of the sentimental, it is quite attractive when the cross lines are painted black on a heavy drawing paper and the heart is colored an appropriate shade of red. Cardboard of about $\frac{1}{16}$ in. in thickness will be found amply heavy. After binding the edges with passe-partout tape, the entire frame should be painted a dull black.

The construction of the stand should commence with the base-board, which, after having been trimmed off squarely and to size, should be uniformly beveled on all four edges. A $\frac{1}{4}$ -in. block is then to be fastened on the under side at each corner. The four square uprights are now to be planed smoothly and cut to exactly the same length. Two blocks measuring $2\frac{1}{2}$ in. square are now to be gotten out, and

four notches cut in each to receive the ends of the vertical pieces, all of which will have to be attended to with some care in order to avoid any open seams. The top block is next in order, after which the small block in the center



One-Light Portable Lamp and Its Details

All that is necessary is to lay out the four sides in a row on a sheet of cardboard, allowing an extra strip of $\frac{1}{2}$ in. at the top and bottom. After the shade is bent into the square form, these stiffening strips are bent inward and fas-

should be prepared and receive a hole in its center for the cord to pass through. The putting together may now be proceeded with. The two top blocks should be first glued together, and then the lower notched block fastened to the base. Place two diametrically opposite vertical sticks in position and secure them to the blocks with glue and a nail at each end. Place the small center block in position and then the remaining two verticals. To cover the nail heads, procure a dozen upholsterer's nails with large brass or copper heads and drive them in as shown. The projection on the end of the socket should be tightly fitted into the top block, and the cord passed downward through the base and out at one side. Prepare four strips of brass, or galvanized iron painted a dull black, and after bending their upper ends so as to support the shade, fasten them on to the top block with screws.

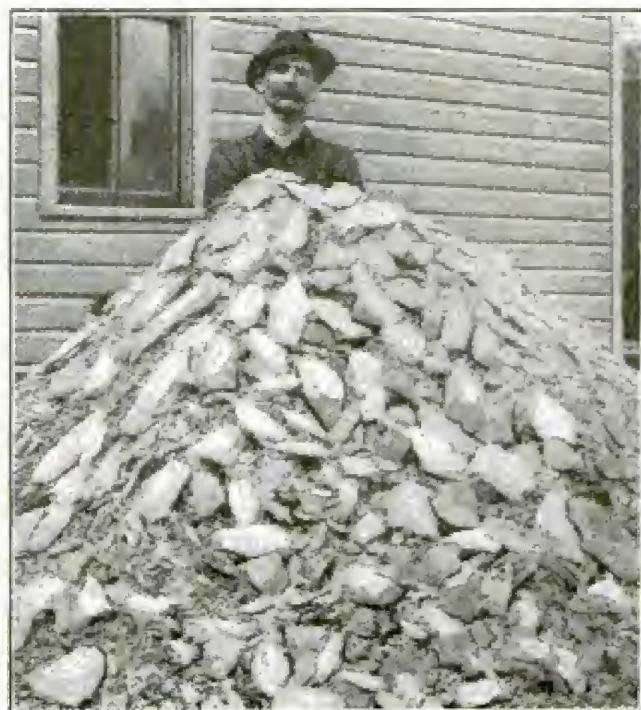
EDIBLE CLAY USEFUL IN MANY FIELDS

No mention of the edible clay deposits of the United States is found in the list of natural resources of America. At least it is not called by that name and yet there are great beds of the clay lying from 10 to 30 ft. below the surface of the earth in the Carolinas and in Tennessee. And it is really edible. Hundreds of the class known as "poor whites," that are found in such numbers in the backwoods and mountain districts of the South, are habitual users of this delicacy. It is pure white and free from grit and is found in great abundance.

There are other uses to which the edible clay is put, however, that make it a valuable commodity. The sheen on playing cards, visiting cards and high grades of paper is supplied by the use of the clay, and wallpaper manufacturers use quantities of it in mixing colors for their product. The most important use to which it is put is in the manufacture of porcelain and other kinds of pottery.

OVER A TON OF SCALE FROM TWO BOILERS

Everybody knows that certain waters will cause scale to be deposited



Boiler Scale Removed from Two Boilers

in teakettles, steam boilers and the like. A large amount of money, probably several million dollars annually, is lost by the lack of efficiency caused by such scale deposits. That these are sometimes greater than may be imagined is shown by the accompanying illustration which is reproduced from a photograph of a pile of 2,100 lb. of scale removed from two boilers in an electric-light plant in Wisconsin. A special form of fire-tube cleaner was employed for this purpose.

AUTOMOBILES AS ELECTION BOOTHS

The extensive use to which automobiles were put in the recent election in England in carrying voters to and from the polls has led to the belief that in the near future automobile voting booths will be utilized in scattered sections. Instead of the voters having to travel to the polls, the booths, conducted by election officers, will travel to the voters.



Preparing for a Char-Pit Demonstration—The Stump Was Removed at a Cost of 25 Cents

A NEW PROCESS FOR REMOVING STUMPS

BY TURNING THEM TO CHARCOAL THE LAND IS NOT ONLY CLEARED ECONOMICALLY, BUT IS ENRICHED

For years the development of the western slope of the Cascade Mountains, and of many other heavily timbered districts in the United States, has been retarded by the difficulty of clearing logged-off land and making it ready for farming. Theoretically the land should be of greater value with the trees removed than as a field for logging operations, no matter how great the timber wealth might be. That, for years, has been the answer of the timber owners to those who contended that the forests should be protected for future generations. But the cost of removing the stumps has been so great that the land converted to agricultural purposes following the course of the logger has been a very limited proportion of the whole.

But a new process has been discovered and is receiving its try-out in

Western Washington. Instead of dynamiting the heavy stumps to get them out of the ground, or of using donkey engines to loosen their grip on the soil, the plan is to turn them into charcoal in the ground, thus enriching the soil, cutting to a minimum the labor required to clear a tract of logged-over land, and reducing to perhaps \$20 an acre the present almost prohibitive cost of from \$70 to \$150 for preparing the logged-off land for the farmer.

Hundreds of thousands of acres lying between the summit of the Rocky Mountains and the Pacific Ocean are awaiting agricultural development. Reforestation is one problem that must be solved, as now there is no comprehensive movement to promote a second growth of timber on lands suitable for forests but not agriculture.



Showing How Soil is Burned to Charcoal by Char-Pit Process

For the immediate future the development of the agricultural areas means much more than reforestation, as years will be required to bring a second crop of fir, cedar and pine to marketable size.

The Oregon & Washington Railway has taken up the logged-off land problem and is doing all in its power to promote to a successful fruition the experiments in the charcoal or "char-pit" process of clearing land as carried



Burning Out a Low Stump



Char-Pit Process Experiment Where Soil is Sandy

on by Harry Thompson, federal expert on farm management, and Prof. W. H. Sparks, of the Washington State College, at Pullman. Prof. Sparks has been making demonstrations at several points in Eastern and Western Washington. He finds that stumps may be removed at a cost as low as 25 cents apiece. Furthermore, the work can be done by inexperienced hands and without costly apparatus. Describing the process Prof. Sparks says:

"The charcoaling or char-pitting is begun by removing the bark from the stump in the spring or early summer to allow the outside of the stump to become thoroughly dry. Often it is well to dig a trench around the stump, or to level the ground about it. Then a ring of wood is stood or piled closely about the old tree base, to a height of 2 ft., and a foot in thickness. Dry rotten wood or bark such as is found in abundance on any new land will answer the purpose.

"This is then completely covered with sod, to a depth of several inches, except a small space on the side against which the wind is blowing. Where no sod is to be found, the wood can first

be covered with a layer of bark, small brush or fern, to keep the loose earth from sifting through.

"Fine kindling is placed in the open space, and fire started and allowed to burn openly until the ring of wood is well afire around the stump. Then a piece of bark or a bunch of fern or grass is thrown over the hole, and the sod covering is complete.

"The stump must now be closely watched and the fire not allowed to burn through the covering, more sod being added as needed. The whole secret of burning the stump completely is to keep the covering intact. If the roots are kept from the air and are recovered as soon as the earth caves, they will burn out completely.

"This method is very economical for large stumps. Small stumps can be grubbed or pulled out to better advantage. The large stumps have been burned out to a depth of 15 ft. While the process is not rapid, work can be carried on by the farmer in connection with his farming, with little additional expense."

In one experiment, 125 stumps, some as large as 3 ft. in diameter, were burned out in four days.

GERMAN MUSICIAN INVENTS MUSIC WRITER



The "Kromarograph," a Music-Recording Machine Invented by a German Composer

A German musician has devised a machine he calls a "kromarograph" which, it is claimed, records each note sounded on a piano and thus serves the purpose of a typewriter, or "music-writer," for the composer. The machine is for the same purpose as the "musicograph" invented by an Italian which the composer, Mascagni, is reported to have used. The German appliance is somewhat larger and is operated by electricity. A roll of paper is placed in



Unique View of Bethlehem, Pa., Showing Evolution of Bridge Construction

the machine and the composer sits at the piano and plays the composition he wishes to record. The record of the notes is carried to the machine and every tone is faithfully registered on the paper. With this device a musician need not trust to his memory to reproduce a musical phrase or complete work, but can instantly record it as he plays it.

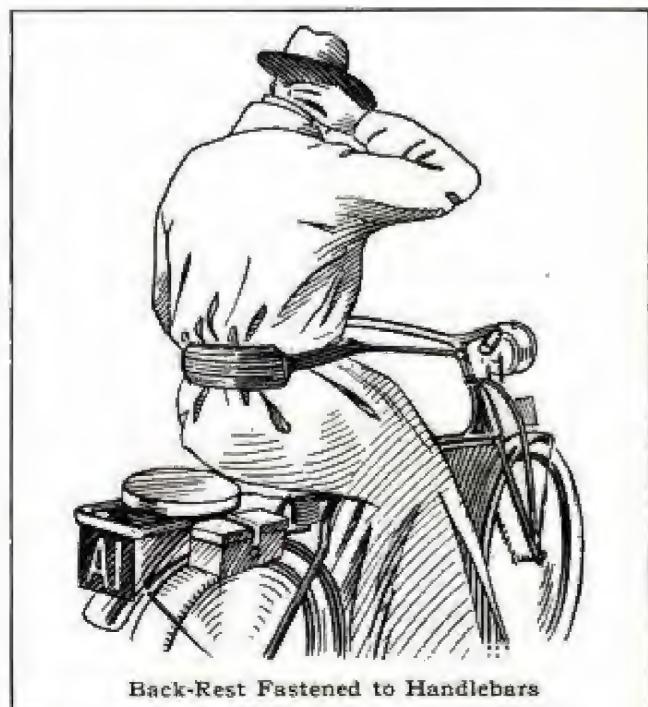
BRIDGE EVOLUTION SHOWN IN BETHLEHEM, PA.

A remarkable view of Bethlehem, Pa., from the banks of the Monocacy River, shows three bridges that depict plainly the evolution in bridge building in this country from the earliest days of the republic to the present time. One of these structures, a covered wooden bridge, is 94 years old and is still in excellent condition. The steel railroad bridge which spans the river but 200 ft. below the wooden bridge was built in 1908, replacing an iron bridge that was constructed in 1885. In the middle distance is seen a new concrete viaduct which has replaced what was known as the old Broad Street bridge in the heart of Bethlehem. Thus the view over the city shows the ancient wooden, the later

form of iron and steel and the modern concrete bridges all within a range of half a mile.

BACK-REST FOR CYCLISTS AND MOTORCYCLISTS

An ingenious back-rest for motorcyclists is fastened to the handlebars



Back-Rest Fastened to Handlebars

or steering column of the machine. This was one of the novelties displayed at a recent automobile show in London, England.



SCIENCE AND MECHANICS IN THE MIDDLE AGES

NO. 1.—THE ALCHEMISTS—One of the most fascinating pursuits of the middle ages was that of the alchemists, who sought to find the means of transmuting baser metals into gold. The accompanying illustration is a reproduction of a woodcut of an alchemist's home as it appeared to an artist of the sixteenth century.

AERIAL MOTOR COMPETITIVE EXHIBITION

A competitive exhibition of aerial motors is to be held in Paris in July under the auspices of the National Aerial League of France. The motors are to be divided into three classes, the first being for motors of 35 hp. or less; the second, for motors of more than 35 hp. but less than 70 hp.; and the third, for motors of 70 hp. or more.

The motors will be officially tested under full power, on two consecutive days, for a period of five hours each day. The engine weighing least per horsepower in each class will receive a prize of \$1,000, and the one of the three prize-winners weighing least per horsepower will receive an additional \$1,000.

RECOVERING TORPEDOES BY ELECTROMAGNETS

The use of electric lifting magnets in recovering kegs of nails from a sunken barge in the Mississippi River, has suggested the use of such magnets for the recovery of torpedoes fired in practice.

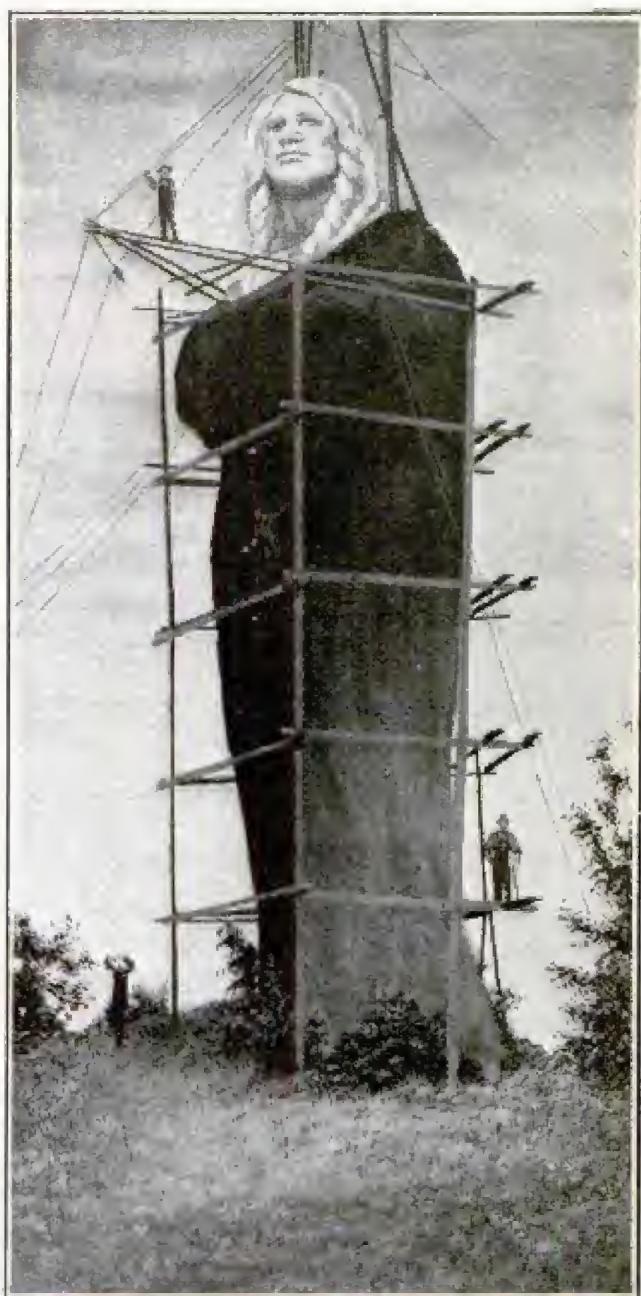
Through some fault of the controlling mechanism, torpedoes often sink to the bottom after their energy is expended, which results in considerable loss, as they are virtually small submarines with self-contained power plants, steering mechanisms, etc. The points where they are lost are to be marked by buoys and the ability of the electromagnets will be given a thorough test in attempting to recover them.

COLOSSAL INDIAN STATUE BUILT OF CONCRETE

The world's biggest Indian now stands with arms folded on a high bluff overlooking the Rock River near Oregon, Ill., visible for miles around. In solemn, silent dignity the massive form rears itself boldly against the skyline from almost every point of the compass, its height of 48 ft. added to an 18-ft. base and the 250-ft. eminence on which it stands giving it an altitude of more than 300 ft. above the surrounding country. The Indian is made of concrete and marks an epoch in statue building, as it is not only a work of art but an example of mechanical genius and engineering skill. It is the work of one of the greatest of the latter-day school of sculptors, Lorado Taft. Mr. Taft conceived the idea of placing the heroic figure of the Indian on the Rock River bluff several years ago and spent much time in working out the plans for the work. The erection of a big statue was not so great a task, but the molding of one in concrete of such size presented a problem of no mean proportions.

Mr. Taft has a summer home at "Eagles' Nest Camp," a colony of Chicago literary and artistic people, near Oregon, Ill., and the unusual natural advantages of the site for such a statue suggested themselves to the sculptor and his friends with added force each summer they spent in their charming sylvan retreat. A 6-ft. model of the statue was first made by Mr. Taft and then he and his assistants set about making the mold and laying the foundations for the big work. They found the job fraught with difficulties. The body of the statue had to be molded where it was destined to stand forever and the erection of the forms for this body occupied much of Mr. Taft's time during the summer and fall. A frame the shape of the figure without the head was made with timber and wire netting, the whole being covered with burlap when the proper proportions were made. This finished, the

whole thing was covered with plaster of paris to a thickness of about 3 in.



Appearance of the Taft Indian Statue Encased in Mold

Ten tons of plaster were required to make the mold and heavy timbers were used to support it. Concrete was poured into the plaster mold and thus the statue was cast. The mold for the head was made separate from the body.

The foundations for the statue extend 30 ft. below the surface, exclusive



Black Hawk's Head Ready to be Placed on Concrete Block

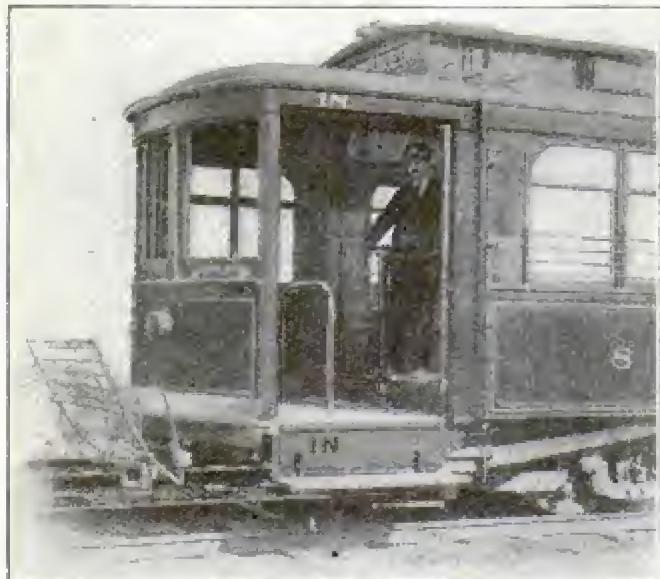
of the base, which is 18 ft. square and stands 18 ft. above ground. From the

bottom of the foundation to the top of the statue, steel rods were run to reinforce the concrete. The total weight of the statue is estimated at 536,770 lb. and 2,275 cu. ft. of concrete were used to make it. Engineers were consulted in the building of the huge figure, so that every precaution should be taken to insure its standing unscathed by the elements. These have estimated that the wind pressure against the statue would be 28,980 lb. and, with these figures, they devised construction of a character that the wind pressure necessary to overturn it must be 673,785 ft. lb. The total resistance to wind pressure acting through the center of gravity through the 18-ft. base is 4,830,390 ft. lb.

Mr. Taft disclaims having attempted to reproduce the form and features of any individual model, aiming rather at an ideal type, although the statue is more or less a portrait of the late "Black Hawk," a famous chieftain of the Sac and Fox tribe. The attitude of the big, blanket-draped figure is contemplative.

NEW PAY-WITHIN CARS

The latest development in street-car construction is the "pay-within" car. This type of car has a single closed compartment from end to end. The conductor stands on an elevated posi-

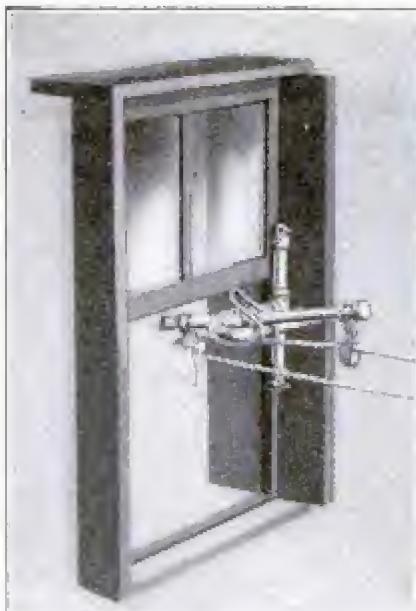


Rear End of Car, Showing Sliding Door Open, Step Down, and Conductor on Elevated Floor of Car

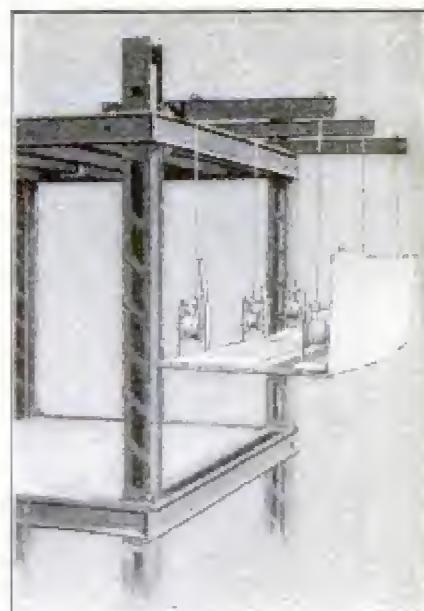
tion near the entrance, at the rear of the car, and controls by means of pneumatic or hand-operated devices the opening and closing of the rear door and the operation of the disappearing or folding steps. He collects the fares as the passengers pass by him. The motorman similarly controls the exit door and steps at the front end of the car. The car is absolutely closed against passengers boarding or alighting while it is in motion. In the typical car there are no bulkheads or partitions separating the end platforms from the elevated floor of the car, but the main features of the invention may be applied to any car without removing the bulkheads. The pneumatically operated type of door operates by sliding, while the hand-operated door folds. The closing of the entrance doors operates a buzzer at the motorman's end of the car, signifying that all is clear and that he can go ahead.



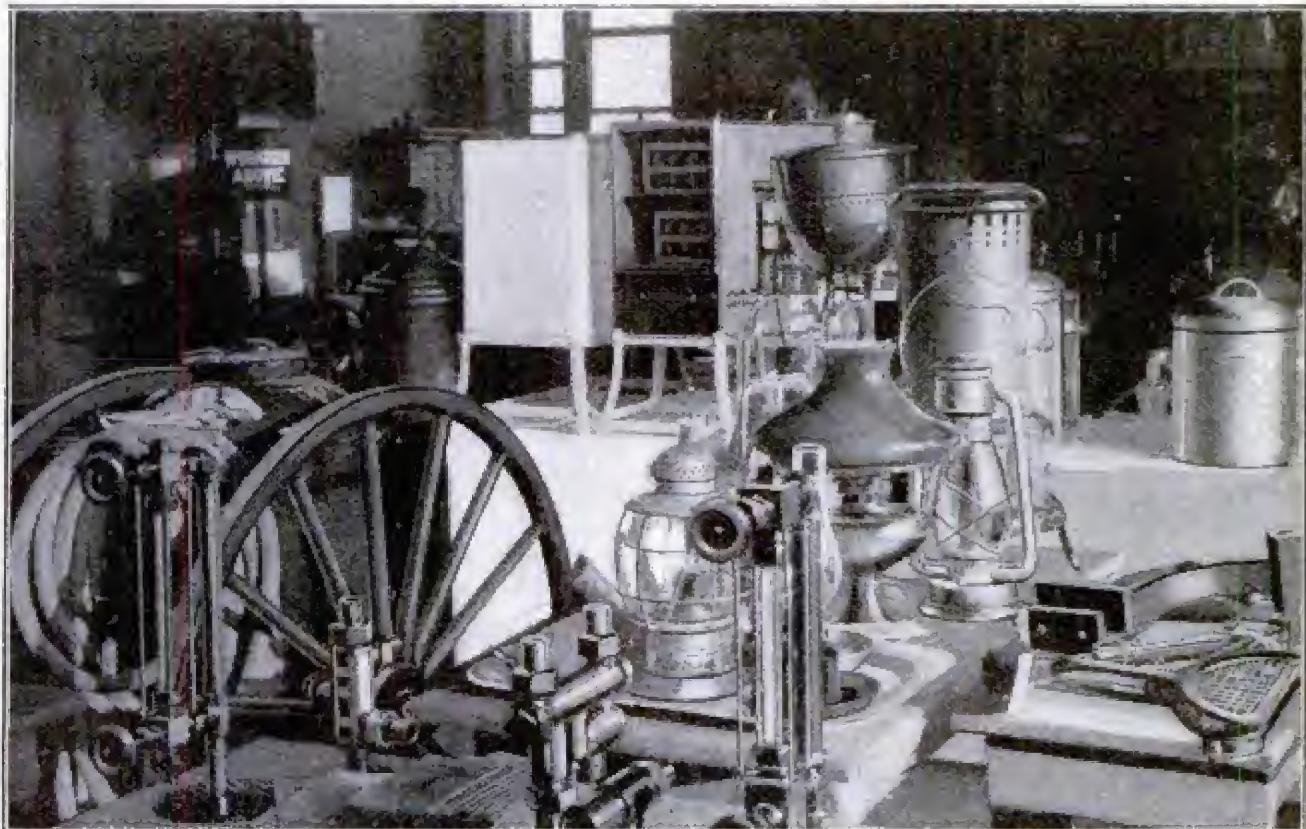
Model of unlocking device for emergency exit doors of theaters and other public places where fire may make rapid exit necessary. On pressing the bar, the door is instantly unlocked



Safety clothes-line apparatus—The clothes can be hung inside the window and when the line is full, the horizontal tube, with pulley attached, is swung upright shifting the line clear from the window



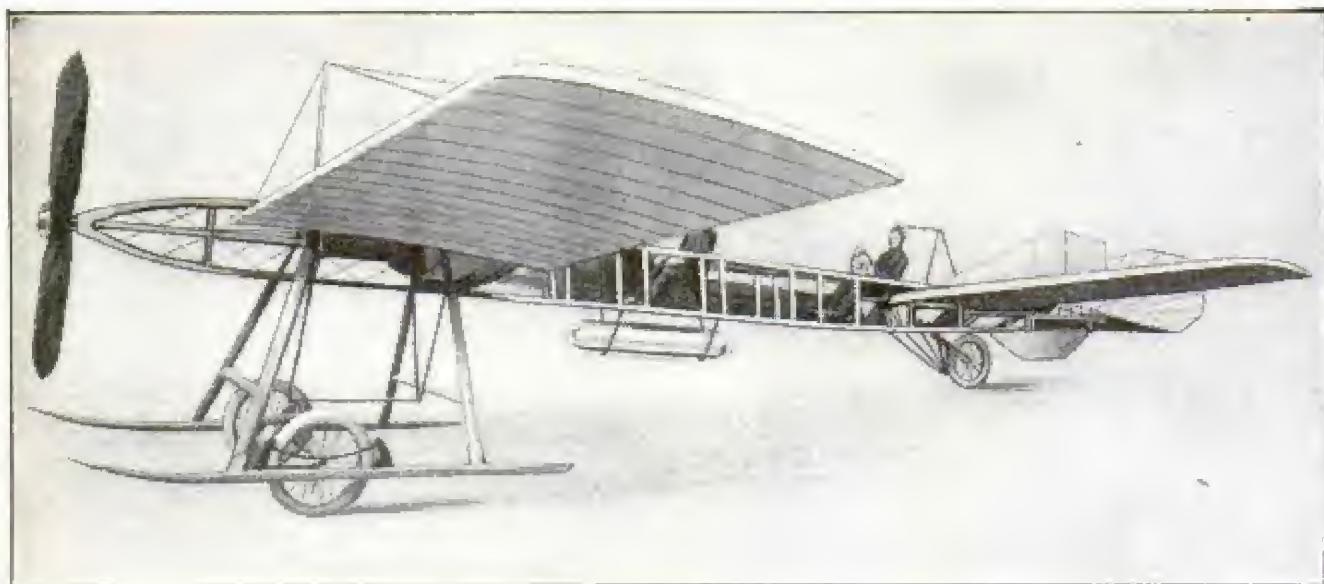
Safety scaffolding clutch which works from protective clutch ratchets suspended by chains from steel beams. A net on its outer edge to keep material from falling on passers-by and injuring them



Scene in one corner of the safety device museum, showing safety lamps, lanterns, valves, fire apparatus, apparatus-guards for circular saws, milk-sterilizing apparatus, etc.

AMERICAN MUSEUM OF SAFETY

CONSERVATION of the lives of workingmen is the object of the American Museum of Safety which was formally opened in New York recently. Hundreds of models of safety devices for all trades and lines of work are here exhibited. The directors of the museum are planning to erect a building especially adapted for the display of appliances for preventing the soldiers of the great American army of industry from being killed or injured.

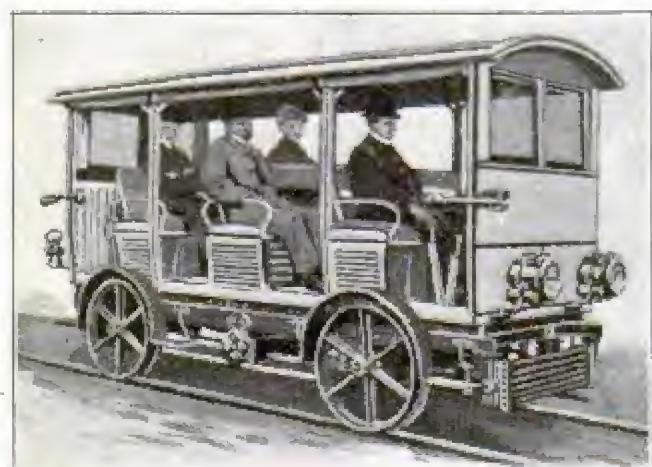


Tandem Monoplane for Military Service

RAILROAD AUTO-CAR USES KEROSENE FUEL

This railroad inspection car, used on a railroad system in England, has several interesting features, among which is the use of kerosene instead of gasoline as fuel. The engine, which is mounted under the central seat, is of a four-cylinder vertical type, developing 20 hp. The carburetor is arranged to work with both gasoline and kerosene, the former being used for starting purposes only.

The car can be driven from either end, the controls being arranged in duplicate. There is also a horn at each end, but the lamps have to be changed. The seats, which accom-



Kerosene-Driven Railroad Inspection Car

modate nine passengers, have reversible backs. The speed is from 12 to 50 miles an hour.

FRENCH MILITARY TANDEM MONOPLANE

The tandem monoplane designed by M. Clerget, presumably for the French army, weighs 1,430 lb. and is to carry three men. The forward seat is for the mechanic in charge of the motor, the middle one for the officer making observations, and the rear seat for the airman operating the machine.

The machine is provided with a 200-hp. motor. The forward wings have a span of 32 ft., and the rear wings a span of 22 ft. The elevating plane and rudder are disposed at the rear end of the frame. The framework is of wood, rectangular in shape and tapering toward each end. The fuel and oil tank, suspended underneath, has a capacity of 66 gal.

INTERNATIONAL BOUNDARY FREAKS IN VERMONT

Officials of the United States and the Dominion of Canada feel satisfied that as the result of work recently completed no jesting vandal can steal the international boundary line and move it backward and forward. It is only recently, however, that the section of the dividing line between part of the state of Vermont and the province of Quebec attained this state of permanence. The old form of iron interna-



The Store at Morse's Line, Vt., Half in Canada and Half in the United States



One of the International Boundary Posts

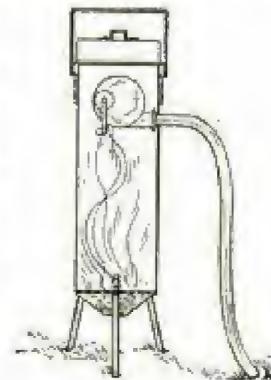
tional boundary posts were not set very deeply in the ground, and it was a common thing to find them misplaced. This sort of thing was most annoying and the two governments decided to stop it by putting in new posts with foundations that extended 5 and 6 ft. below the surface. The new posts are also of iron and are set in cement so firmly that even an earthquake would not budge them.

Some strange conditions are found in Vermont and Quebec along the boundary. There are several buildings that lie on both sides of the "line." One of these at Beebe, Vt., contains two postoffices. Should a letter be mailed at the Vermont office, in the front room, destined for the Quebec office in the back room, it would be necessary to send it 157 miles to another Vermont office before it could be sent into Canada. The house of a physician at Derby Line, Vt., lies across the border with the kitchen in one country and the parlor in another so that every time the cook serves tea in the front room she is compelled to go into a foreign land to do it. One of the most unique international business establishments is located at Morse's Line, Vt. One of the boundary posts is directly in front of this establishment, the "line" running through the center of the store, the post being placed at the edge of the

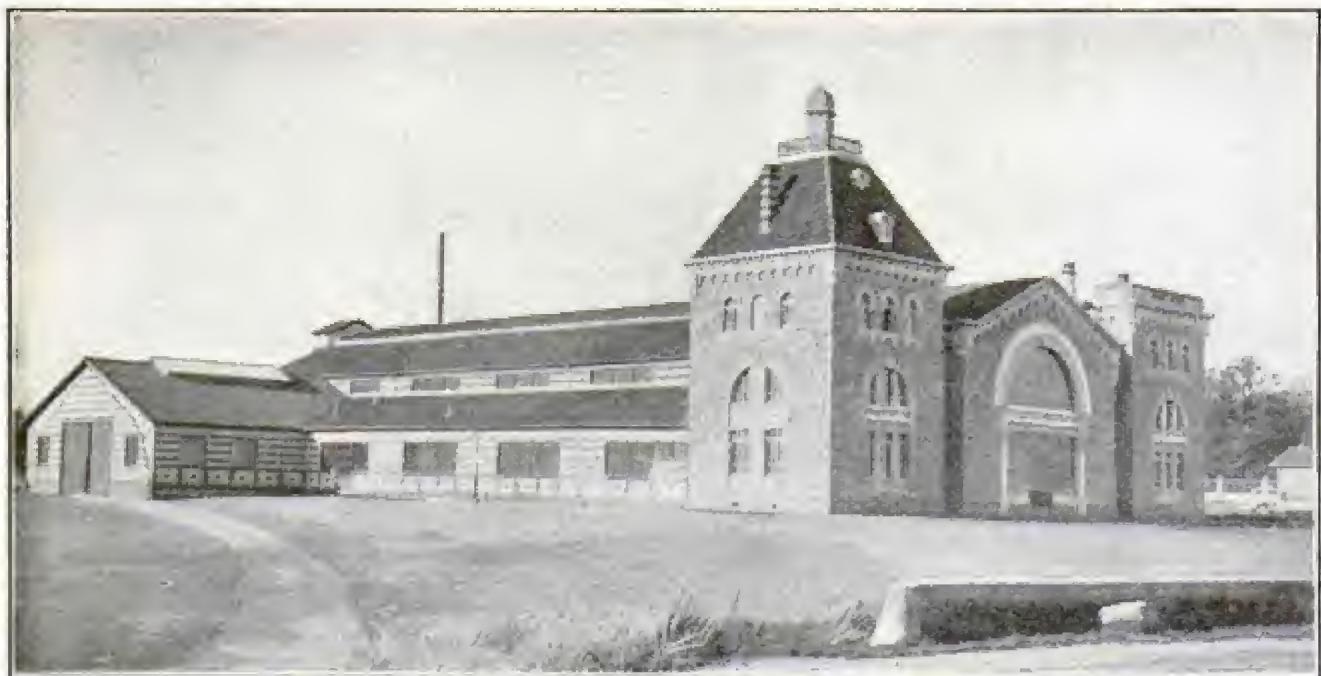
porch in front of the store. Thus one side of the store is in Canada and the other in the United States.

APPARATUS EXTERMINATES FIELD MICE AND MOLES

A light portable apparatus for the extermination of field mice and ground moles is used very effectively in France. The body is a cylindrical receptacle with a conical bottom forming a grate. Straw and a little sulphur is burned on the grate, and the fumes and smoke rise to the top of the cylinder, where they are caught by a crank-operated fan and forced through a hose. The nozzle of the hose is inserted in the tunnels made by the animals, and the crank turned by the operator. Only a few seconds are required for the operation at each hole, a shield near the nozzle forming an air-tight covering for the hole.



The common council of Toledo, Ohio, has passed an ordinance that all explosion engines operating within the city limits must be provided with mufflers.



Erected near Paris for Aerial Experiments

GUARD AND PROTECTOR FOR ELECTRIC LAMPS

Much annoyance has been caused by breakage or theft of electric lamps accessibly located in public places. Every time a lamp is broken or stolen there is inflicted a loss which means more than the money required for replacement; danger to life or limb or to property may often result.

The lamp guard shown herewith locks with a key, without which the guard and lamp cannot be removed. The lock is said to be proof against picking.

In the illustration, the key, which may be worn on an ordinary key ring or chain, is shown ready for insertion.

The "E" string of a violin belonging to the captain of an Atlantic liner saved the life of one of the passengers on the ship when catgut ligaments in the surgeon's kit were found to be defective and the passenger's life depended upon the proper uniting of the wound made in connection with an operation for appendicitis.



AEROTECHNICAL INSTITUTE IN FRANCE

The aerotechnical institute at St. Cyr, near Paris, erected at a cost of about \$100,000, is the finest establishment yet conceived for study and experimental work in aero-dynamics and flight. The studies and experiments are pursued under the control of a committee of scientists, technical aeronautic engineers, and practical airmen. The money for the erection of the institute was donated by M. Deutsch.

DOG HOSPITAL IN OLD STREET CARS

The proverb of the ill wind is exemplified in the manner in which a Chicago man has evolved a haven for aristocratic dogs from a graveyard for street cars. This man has created a dog's paradise in that section of the big western city known as Ravenswood, using six worn-out street cars that not alone furnish the dogs a most comfortable place in which to take the rest cure, but also provide the owner and manager of the place with a most unique home. The cars used for the purpose are all of the stove-heated type and are practically impervious to the elements. The place covers two



Old Street Cars Used as Dog Sanatorium

and one-half acres and there are ample yards in which the canine society favorites can take the air. Steel fencing, once used for a similar purpose in a Chicago municipal office, forms the partitions between the yards and a barrier against too free access to the place itself. These fences are of steel wire of the finest type and afford thorough protection to the occupants of the unique houses.

The manager of the place has some of the finest dogs in Chicago on his list of boarders. He makes a specialty of

caring for high-bred dogs during the absence of their owners in the summer and has also a hospital attached to the place where he treats dogs for all sorts of diseases. He lives in one of the cars which has been fitted up in a most convenient and comfortable style.

A UNIQUE CONCRETE FOOT- BRIDGE

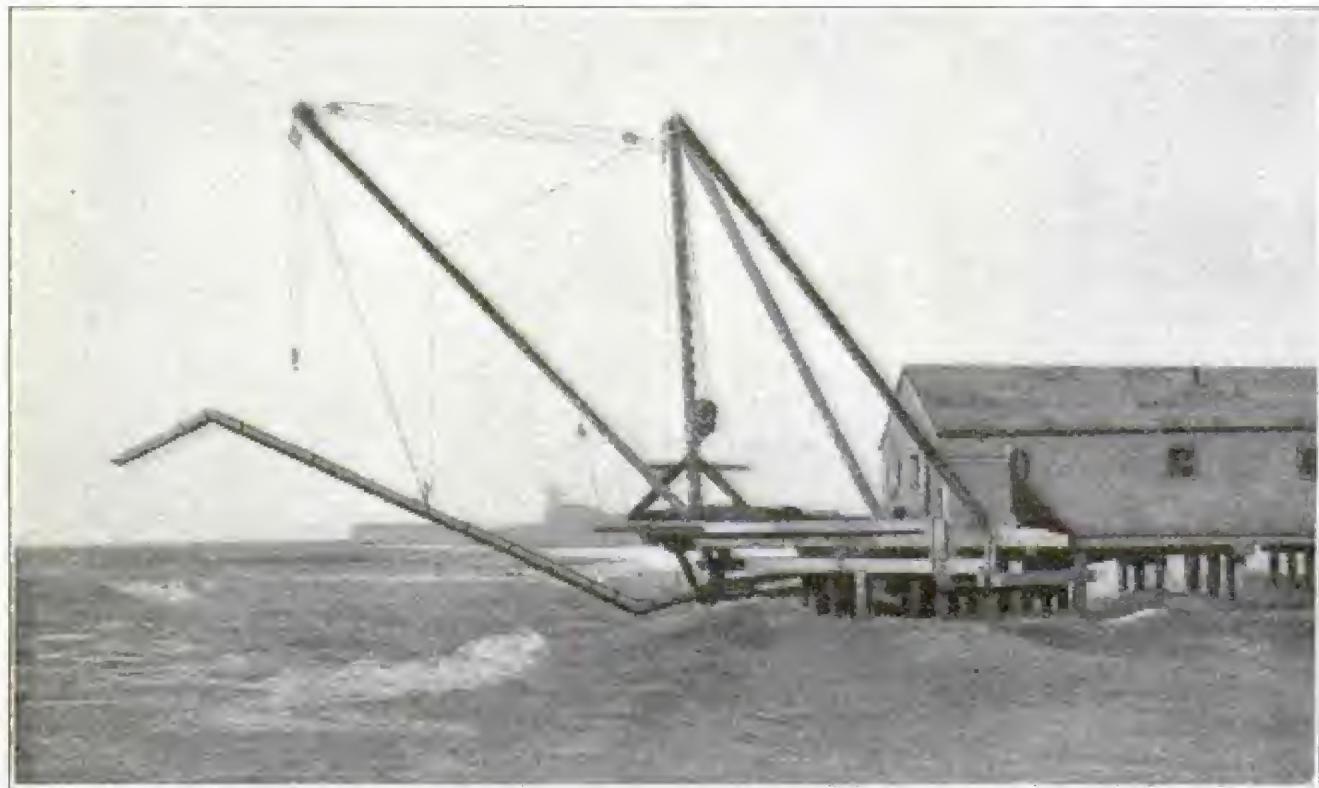
The use of reinforced concrete for light construction work of considerable proportions is exemplified by the



Concrete Footbridge at Stockbridge, Mass.

unique and artistic footbridge recently erected over the Housatonic River at Stockbridge, Mass. This bridge has a clear span of 100 ft. in length, with a rise of only 10 ft. The width of the bridge is 7 ft. 6 in. The arch is 7 in. thick at the crown and is reinforced with 7-in. I-beams. The bridge successfully withstood a test load of 25 tons at the center, before it was opened to the public.

centrifugal pump started. As each incoming breaker sends a quantity of water into the hole, there is no lack of water, and each incoming tide washes up sufficient sand to fill the hole left by the last dredging. Were it not for this fact, it would have been impossible for the dredge to be built in this position and kept supplied with sand. At low tide the pump has to be stopped, as no water reaches the hole.



Sucking Up Sand at Far Rockaway, Rhode Island

AN INGENIOUS HYDRAULIC-DREDGE INSTALLATION

Erected on piles driven deep into the sand on the beach at Far Rockaway, Long Island, is a large suction dredge, which is being used to fill in the swampy land in the vicinity. The sand is drawn directly from the beach and forced through a pipe line about two miles long to the swampy land.

The most interesting feature of this particular dredger installation is that no matter how steadily the sand is sucked away, there is no perceptible lessening of the supply and the holes from which it is taken never grow beyond a certain size. As the tide recedes, a hole is dug in the sand, the long pipe lowered into it, and the large

AUTOMATIC SUPERVISION OF TELEPHONE SERVICE

A new telephone apparatus being introduced by an American manufacturer is stated to accomplish most completely the requirements for automatic supervision of telephone service. This is a form of local-battery telephone in which the act of removing the receiver from the hook switch automatically signals the exchange, and the restoring of the receiver to the hook automatically gives the clearing-out signal, in this way obviating the necessity for the operator to listen and thus ascertain when the circuit is idle. This convenient apparatus can be adapted for use on either individual or party lines, as desired.

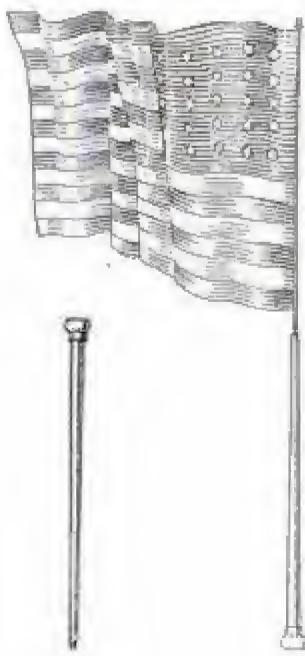
PARIS CANAL PROJECTED FOR TWO PURPOSES

The idea of converting Paris into a seaport, advocated for many years by prominent French engineers without receiving the smallest public support, has been revived as a means of protecting the city from the floods which have ravaged it during the past two or three years.

The conversion of the Seine into a canal from Paris to Rouen would, it is believed, take care of the surplus water as well as provide a waterway for the passage of ships of heavy tonnage. The other scheme for the relief of flood-stricken Paris is a canal connecting the Marne and the Seine, to the north of Paris. If it is found that the cost of deepening the Seine will not be much more than the estimated cost of the Marne-Seine canal, the scheme may be carried through.

MISSIONARY'S FLAG-CANE

The desire of a missionary to Persia



to carry both an American flag and a substantial cane about with him in his walks led to the invention of this novel walking stick. The flag is $2\frac{1}{2}$ ft. long by 2 ft. wide, and the cane is solid enough to provide an excellent support in walking, and a means of defense should such be necessary.

One of the odd industries of the United States is the manufacture of a special kind of wire for keys for sardine cans. These keys are made in Norway, in which country no less than 25,000,000 were turned out in 1910.

KNEE BRACES FOR A BABY LLAMA

In an attempt to cure a bad case of knock-knees, a unique mechanical experiment is being performed upon a



Correcting a Case of Knock-Knees

valuable two-months-old baby llama at the Cincinnati zoological garden. He persists in rubbing his fore knees together. Various ways to correct the fault were tried, but not until the steel forms with their straps were made and applied was any success noted. The little fellow now walks and frisks about with the braces on without having his knees bother him. The mechanical device will be continued until he has outgrown the fault.

VARIABLE SPEED MOTOR

An English inventor claims to have devised an aeroplane engine (working on the same principle as the Gnome rotary motor) which can be started slowly and run at almost any speed. It is said that such an engine would remove the necessity for vol-planing when descending quickly from great heights.

ICE HOUSE MADE OF FREIGHT-CAR DOORS

This ice house is unique because it was built of discarded freight-car doors, about 150 of which were used. Sections of box-car bodies were util-

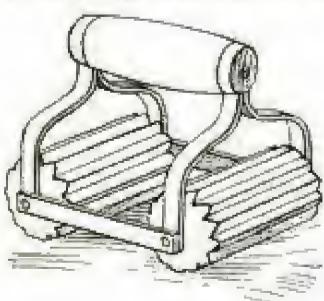


Novel Use Made of Freight-Car Doors

ized for roofing and also for boarding up the ends of the building under the roof. The ice house is located in New York state.

HAND-WASHER FOR LINEN ARTICLES

This little French device, consisting of two grooved wooden rollers fastened



to a suitable handle, is used in place of a brush or hand-rubbing in washing linen. The article to be washed is first soaked in

soapsuds and then placed on an inclined board. The washer is then rolled over it under slight pressure to work the suds through the fabric.

It is estimated that the farmers of the state of Iowa alone use every year \$1,400,000 worth of new fence posts, which cost about \$600,000 to set in the ground.

SHIP PROPULSION BY MEANS OF ACTION OF WAVES

A Brooklyn inventor is attempting to convince marine engineers of the practicability of his plan of propelling vessels across the ocean by means of wave power. His idea is to place water tanks fore and aft and locate a piston rod provided with a series of cogwheels in the center of the vessel. His belief is that the weight of the water stored in the tanks will, applied by means of the rise and fall of the hull, be sufficient to operate the machinery.

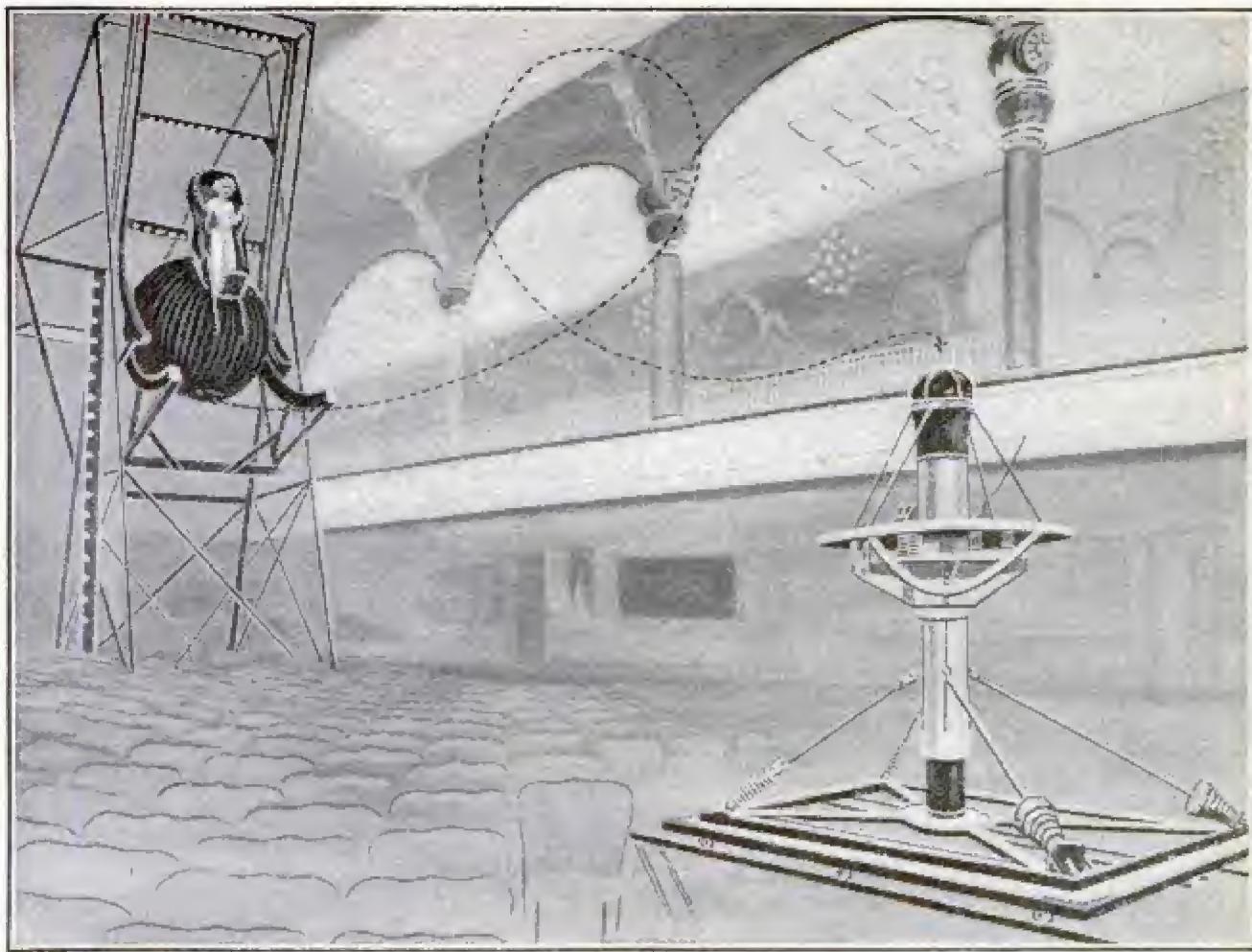
"When a wave strikes the vessel fore or aft," says the inventor, "tons of force would be thrown upon the operating machinery from one series

of tanks, and the machinery would also be simultaneously affected by the suction of the receding waters in the tanks at the other end of the vessel. It would not, therefore, affect the power of propulsion if the tides were adverse to the course of the ship."

"LOOPING THE LOOP" ON A BALL

This new "thriller," devised by a Frenchman, is of a kind that seems almost impossible. The nicety of calculation involved is much greater than that of the "loop the loop" automobile, because this ball, with a woman seated on the outside of it, not only describes a loop, but must land with the woman uppermost on the pivot provided to receive it.

The ball is made of willow, which is the only wood sufficiently elastic to withstand the shock. On one side of it is a chair-like support for the woman, and on the other a hole. Launched from the scaffolding, it takes an upward curve and describes a loop, then lands upon the pivot shown at the



The Latest French "Thriller"—Socket in Ball Must Land on Pivot

right of the illustration, in the same manner as would an apple if allowed to drop on an upturned spike, only that the ball is already provided with a hole for the pivot to enter.

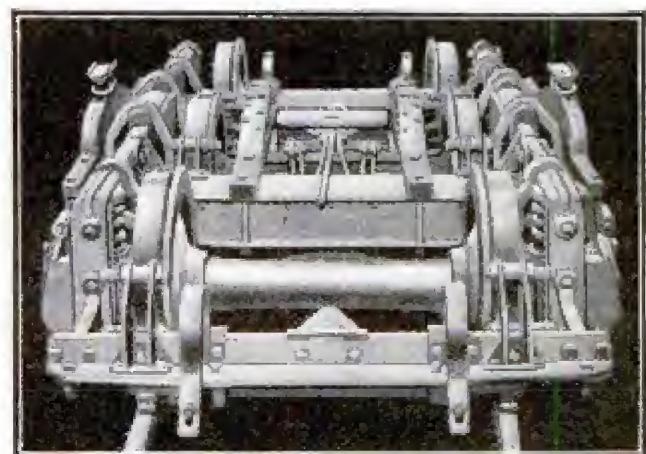
The pivot is provided with shock-absorbing springs, and, to further diminish the shock, the whole glides on a track. The inventor claims there is no possibility of accident.

SIX-WHEEL TRUCKS FOR NARROW-GAUGE CARS

The new train, consisting of four cars, for the president of the Argentine Republic is mounted on six-wheel trucks of an interesting design. The government railways of this South American republic have a gauge of but 3 ft. 3 $\frac{3}{8}$ in., and the trucks hitherto used on the regulation rolling stock are of the four-wheel type.

The special six-wheel trucks are of the same type, using spring-link

suspended equalizing bars, journal springs, solid forged side frames, etc. The side frames or wheel pieces, 11 ft. 1 in. in length, are said to be excel-

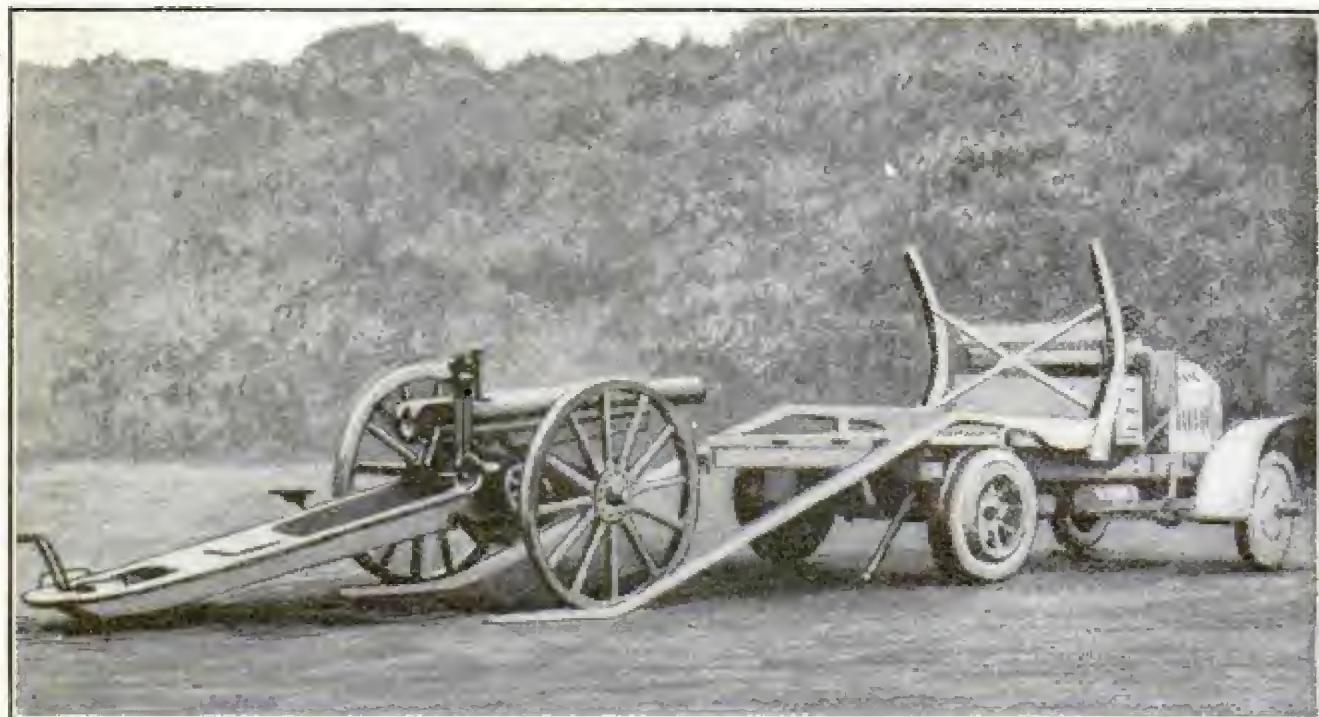


Trucks for Argentine Republic Presidential Car

lent examples of the solid forging process and its unlimited possibilities in truck designing.

Electric street cars and telephones are being introduced in Lebanon, Syria.

AUTOMOBILE GUN CARRIAGE TESTED IN GERMANY

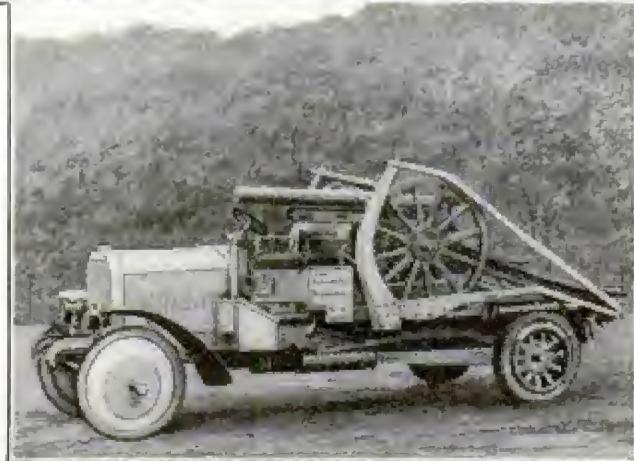


New Military Motor Design
for Light Artillery, Showing Manner of

A new motor car for light artillery, which permits the use of motor traction with any type of field gun, has been successfully tested by the German military authorities. Grooved runners are lowered from the rear

of the car to permit the gun being taken off to any part of the field by hand. When not in action, the gun is rolled onto the platform over the grooved runners, and these latter are

action. Military men regard it as one of the most practical applications of motor traction to artillery that has yet been devised, and it is thought this method will be generally adopted.



Courtesy of the London Illustrated News
Gun Secured on Motor Truck

ed to Transport Field Artillery
Running Gun onto Truck

raised and fitted over the wheels in such a manner that when they are secured to the body of the car, the gun is held firmly in place and can be moved at high speed. This car is to be used as a platform for the gun while in

NAVY EFFECTIVELY GUARDS ATLANTIC COAST

The efficiency of the United States Navy was put to a most severe test, through which it came with entire success, on the recent return of the battleships from their European tour. The cruiser divisions under Admiral Staunton, which had remained in waters of

the United States, were notified that the battleships would attempt to land a force of men in the United States at some point between Charleston, S. C., and St. Augustine, Fla. Rear Admiral Schroeder, commanding the battleships, was directed to use his best efforts to

effect the landing, the strip of coast given him for the purpose offering a radius of several hundred miles. Admiral Staunton sailed from Hampton Roads with his fleet of cruisers on Jan. 4, and on the morning of Jan. 8 discovered his enemy in the Atlantic, 1,380 miles off St. Augustine. The cruisers were kept in continual communication with their commander by means of wireless and assembled at the call of the vessel which discovered the "enemy" as a defending fleet would have assembled to repel an attack. Admiral Schroeder did not know he had been discovered until Admiral Staunton's entire fleet was lined up to oppose him. The feat of the cruisers is regarded as one of the most important demonstrations of naval efficiency of the year.

SIX-ROOM APARTMENT ON A PRIVATE TROLLEY CAR

The development of electric traction has given rise to the increased use of private trolley cars that are becoming more and more luxurious and complete. The finest example of this type in the country is believed to be the car just turned out by a Cleveland concern for the head of a New York State traction company. The fortunate occupant of this car is provided with a complete six-room apartment consisting of parlor, dining room, smoking room, kitchen, toilet room and a retiring room, which is provided with a couch



Kitchen Built in Private Trolley Car Showing Range, Refrigerator and Shelves for Dishes

and lavatory and can be used for sleeping. The car is 54 ft. long over the vestibules, and has an inside width of 7 ft. 5 3/4 in. At one end is the smoking compartment and at the other, the parlor. These two, with the dining room, which occupies the center of the car, extend across the entire width of the car. The cabs for the motorman at either end of the car are just large enough to accommodate the man and controller. The entrances to the car are through these cabs. The space at the two ends not used for the cab is provided with observation windows. Between the dining compartment and the smoking room is located the kitchen, which is provided with a buffet range, a sink and a refrigerator. Between the dining room and parlor is the retiring and toilet rooms. A narrow corridor at the side connects the dining room with the two end compartments. The entire car is finished in hard wood. The smoking and dining rooms are furnished in mission style and the parlor compartment has wicker furniture. The lighting scheme is worked out with handsome fixtures in keeping with the other furnishings in the rooms.



End of the Parlor Compartment on Private Trolley Car Showing Motorman's Cab and Observatory Window

The Federal government is experimenting in the culture of cork trees on the old military reservation at Brownsville, Texas, recently abandoned by the War Department.

HOLDING BACK A GREAT LAKE WITH EARTH

The big Belle Fourche irrigation dam in South Dakota, which is the largest earth embankment in the world, is nearing completion. Construction of the project was authorized by Congress on May 10, 1904, at a cost of \$5,000,000.

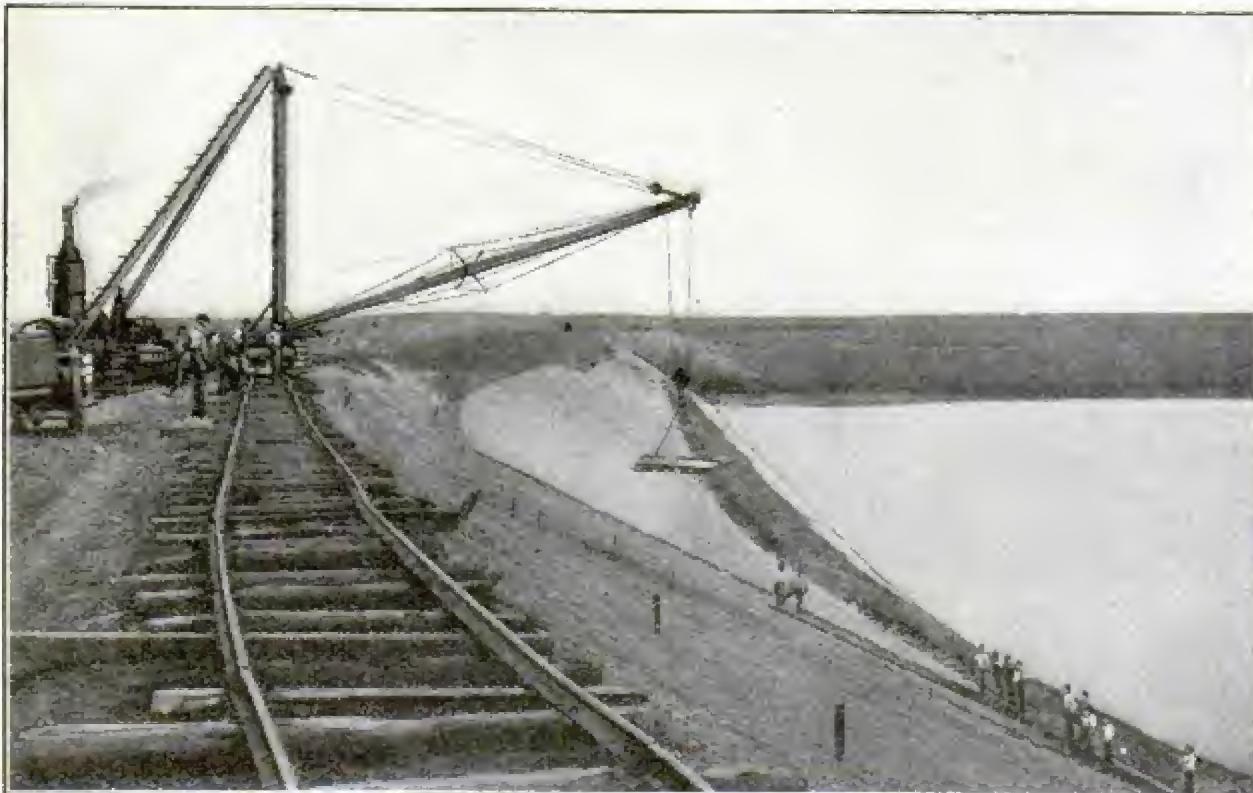
From an engineering standpoint, the Belle Fourche project is one of the most interesting which the government has yet undertaken. Its principal structure is the earthen dam. This wonderful dike which closes the lowest depressions in the rim of a natural basin, is 6,200 ft. long, 20 ft. wide on top, and 115 ft. high in the highest place. The inside face of this structure, which has a slope of 2 to 1, will be protected from wave and ice action by 2 ft. of screened gravel on which will be placed concrete blocks each 4 by 6 ft., and 8 in. thick. The cubical contents of this dike will be 42,700,000 cu. ft., or about half of the famous pyramid of Cheops.

The reservoir created by this dam will cover about 9,000 acres, and will

be the largest lake in the state. It will receive water through an inlet canal 6½ miles long, 40 ft. wide on the bottom, and capable of carrying the entire flow of Belle Fourche River. When the distribution system of the project is completed, 600 miles of canals and laterals will carry the waters over 100,000 acres of land. About 30,000 acres already are receiving water.

In connection with the project is a diversion dam of concrete weir type, having a height of 23 ft. The length of its masonry crest is 400 ft. The diversion dam is located about two miles below the main project.

The Belle Fourche irrigation project covers a territory of 150,000 acres, of which 100,000 acres will be irrigated in the Belle Fourche Valley. This tract lies on both sides of the river, begins two miles east of the town of Belle Fourche and extends eastward for 40 miles. Within the area are included 50,000 acres of public land, 45,000 acres of private land and 5,000 acres owned by the state of South Dakota. Owing



Placing the Paving on the Upstream Face of the Belle Fourche Dam

to the rolling character of the region, however, much of the land included between the main canals lies above the ditch, so that it is possible to irrigate only 100,000 acres. The lands have, where possible, been so divided that

VACUUM CLEANER ROUTS CARPET PREJUDICES

The vacuum cleaner has removed the prejudice of many people who oppose carpets on hygienic grounds, as well



Spillway at Head of Waste Channel, North End of Belle Fourche Dam

each farm unit will contain a portion of dry pasture land as well as irrigated land. Twelve thousand acres in the project are now being supplied with water, the irrigated area is being increased as fast as the canals are completed, and 42,000 acres of irrigable land will be covered with water for 1911 spring crops.

BERLIN'S AVIATION FIELD

A new aviation company has purchased the Johannisthal aviation field at Berlin from the Prussian government and will transform it into one of the best arranged fields of the kind in any part of the world. The extent of the field is 741 acres. Trees will be transplanted all around its border, and the grandstands and other seats will be removed from the open field to the edge of the bordering fringe of trees, which will afford considerable protection against the sun.

as the dust and dirt that hides in them. The result is that carpets and rugs are again becoming popular with that class of citizens who did not view with pleasure cold bare floors. This significant fact dealers in floor coverings have discovered through the increased volume of their business. The opposition to the use of carpets was largely based on their germ-collecting capacity. The use of the vacuum cleaner has entirely eliminated this danger and today the carpet is practically as safe, so far as general health is concerned, as the polished hardwood floor, provided, of course, it be subjected to frequent cleansing with the vacuum machine.

Interior decorators are again figuring the floor into the color scheme of the rooms and they welcome its return to a status that will permit the application of more color than is usually found in hardwood.

DEVELOPMENT OF THE SCUTTLE DASH ON AUTOS



The space which is ordinarily waste room on automobiles having the new expanded scuttle dash is utilized by one French motor concern as a space for the chauffeur when he is not driving the car.



Another European manufacturer has introduced a novel lamp arrangement on the dash. The fixture is thus made part of the body and will not become loose. It also puts the control of the lights at the driver's hand.

SUPREME COURT MAY HAVE PALACE OF JUSTICE

Plans for the construction of a palace of justice to house the Supreme Court of the United States on the plot of ground just north of the Library of Congress at Washington, are being given serious consideration. The recent hearing of the tobacco-trust case in the present Supreme Court room of the Capitol building called attention to the small quarters the court occupies. There were more than 700 lawyers in attendance and there was not room in the court room to accommodate them.

The proposed building, for which plans have been drawn, is to be on an artistic scale equal to that of the Library of Congress, and is designed to house not only the Supreme Court, but also the arbitration court, if such be formed.

\$50,000 PAID FOR A FAMOUS VIOLIN

It is reported that Kubelik, the great violinist, has purchased the celebrated "Emperor" violin for \$50,000. This instrument, which has thus sold for about 100 times its weight in gold, is the most famous violin made by Antonio Stradivari, who lived from 1649 to 1737 in Cremona, Italy. The prices of the best violins of Stradivari and Guarneri del Gesù range from \$1,000 to \$2,500, although several have changed hands recently at a much higher price. A few years ago one was sold at Stuttgart for \$10,250, a figure which was considered remarkable at that time.

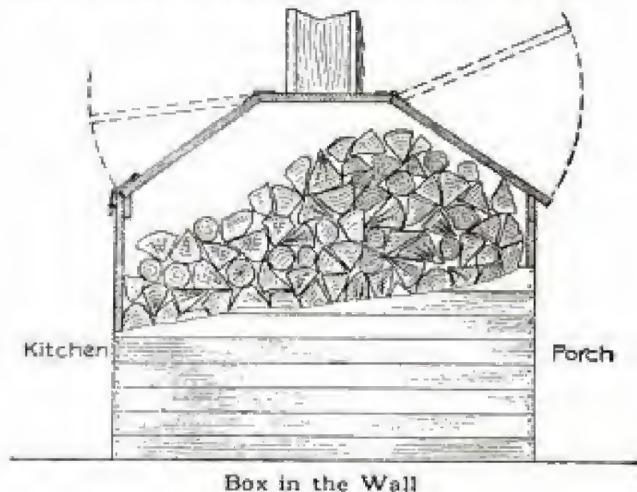
Indications point to the repeal of the law which prohibits the running of automobiles on public roads in Prince Edward Island.

SHOP NOTES

Wood Box in the Wall of a House

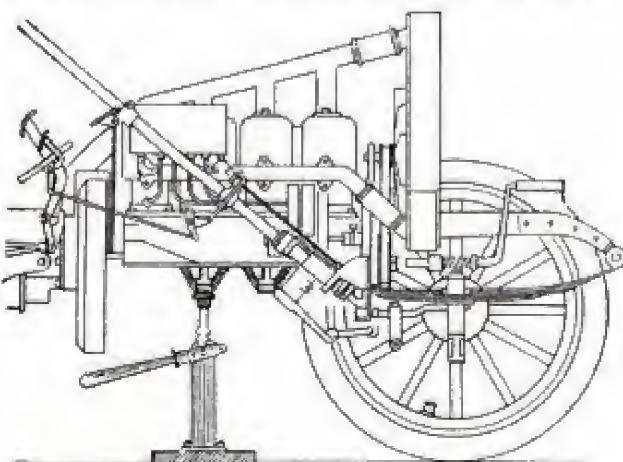
In planning a house or remodeling the kitchen, provision should be made for storing a liberal quantity of stove wood, heater chunks or coal, so as to avoid going out in the rain or snow to the wood shed for the house supply, which in a protracted cold spell must be replenished often. The sketch shows how a built-in wood box may be arranged to load from the outside and emptied from the inside. A spring lock or hasp on the kitchen side keeps the box closed against entry from the outside. This box insures a lasting supply of dry wood, as it may be built as large

as one's needs demand.—Contributed by Victor Labadie, Dallas, Texas.



Finding Loose Bearings in Automobile Engines

The usual method of finding "play" in connecting-rod bearings on automobile engines is to remove the lower half of the crank case, open the cylinder relief cocks and "feel" the connecting rods either by hand or a pry-bar. Often the play is so small that the hands fail to locate it, in which case the pry-bar



Jack under Crank Bearing

is used. Very often no leverage can be had on the pry-bar, then this method is not positive.

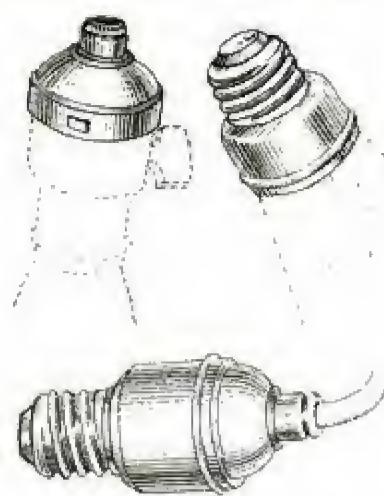
When there is any uncertainty about the pound or looseness of a rod or main bearing, a heavy pry-bar with exceptionally good leverage must be used to "feel" the crankshaft in its bearings. It is very inconvenient, however, to work such a bar up and down beneath a car.

The best method I have found is shown in the sketch. Run the car over a pit, if possible, although the bare floor will do. Raise the car by means of a jack to suit the conditions for testing. If the rod bearings are to be tried, run a jack head against the lower half of the connecting-rod bearing and work the jack handle up and down. The smallest amount of play can be detected in this way, especially on the main bearings, where the pressure of the jack is applied on the crankshaft against the weight of the car and "play."—Contributed by L. A. Prince, Cincinnati, O.

CA good slate-colored paint for a roof is made from white lead, lampblack and yellow ochre.

Attachment Plug Made from Lamp and Socket Parts

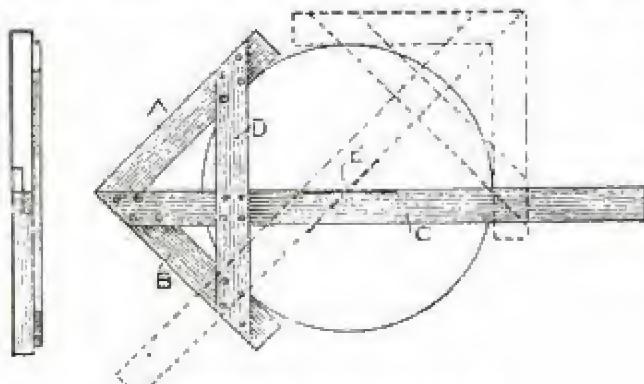
The accompanying illustration shows the parts that are used from an electric lamp socket and the metal base of a tungsten lamp to make an electric plug.



The glass is broken away from the metal base of a discarded globe and the cap from a socket will fit snugly in the place of the glass. The wires are soldered to the places where the filament connections of the lamp were attached. The finished plug will have as good an appearance as one purchased from an electric supply house.—Contributed by Lee Kittridge, Jackson, Mich.

Tool for Finding the Center of Shafts

The center of a shaft, a round casting or a large round object may be easily found with the tool shown in the illustration. To make it, nail together two pieces of board, A and B, so that they form a right angle, and fasten a long piece, C, so that one of its edges



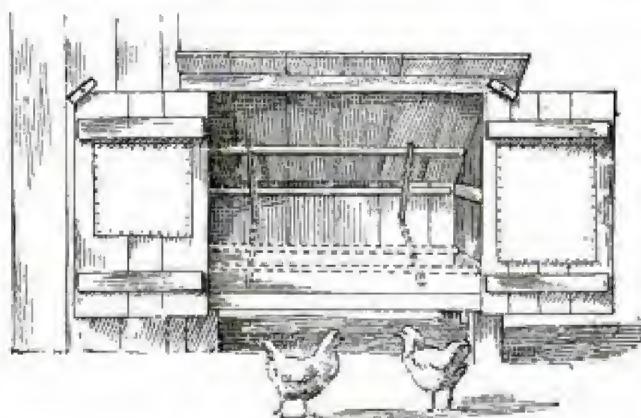
Finding the Center of a Shaft

bisects this right angle, a brace, D, being nailed over the three pieces to insure rigidity.

Lay the device on the end of the round object with the right angle drawn closely to the circumference and then draw a line along the edge of the long piece C. Move it to another position and draw another line. The intersection, E, of these two lines will be the center of the object.—Contributed by Walter Johnson, St. Paul, Minn.

A Chicken House

The owner and designer of the chicken house shown in the sketch has had remarkably good returns from his poultry, getting plenty of eggs at a time when other chicken keepers in the neighborhood were buying from the grocer, and he ascribes much of his success to the novel features contained in his device.



Sanitary Chicken House

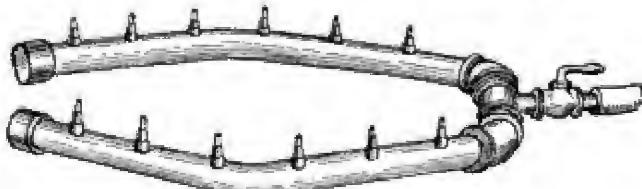
The house has a southern exposure, and the two doors which form the front can be thrown wide open so that the interior gets a sun bath every day. In addition to the frequent coats of whitewash, lime is sprinkled on the floor, which is easily kept clean. The doors are fitted with windows, unglazed, but screened with ordinary burlap, which allows sufficient ventilation and still keeps out objectionable drafts.

The most novel feature of the device is the roost, which is fastened by hinges to the rear wall and can be raised to the roof and hung on a hook, thus making it easy to clean the floor. At night the roost is let down and rests on two iron feet, and these, together with the roost, are covered with crude oil which does not need renewing very often. As

a result of this cleanliness, exposure to the sun and treatment with oil, there is not a resting place in the chicken house for the insect pests which make hens unhealthy and disinclined to lay, and the cost and care are practically no greater than with the old-fashioned house.—Contributed by C. L. Edholm, Los Angeles, Cal.

Portable Gas Heater for a Steam Furnace

Often in the fall and winter months and even early in the spring, it is desirable to have heat in the house for a short time only—just enough to drive off the chill. It is inconvenient and wasteful to build in the furnace a coal fire large enough to generate steam, for when the rooms are warmed, the surplus heat is allowed to escape through the smoke pipe. The sketch shows an inexpensive and easily constructed gas heater which I have made and used with much satisfaction. A piece of pipe shaped like a horseshoe, with about twelve 2-ft. burners, is inserted in the upper small door of the furnace and supported on the ledge of the small door in the rear. Rubber tubing is attached to the stop-cock and connected with the nearest gas-pipe. After allowing a gallon or so of water to enter the boiler, ignite the heater. Because the burners are in close contact with the boiler, steam is generated quickly and the house becomes warm at trifling expense. Where it is desired to start a coal fire, the heater may be removed instantly and hung on the wall for future use. Of course, with

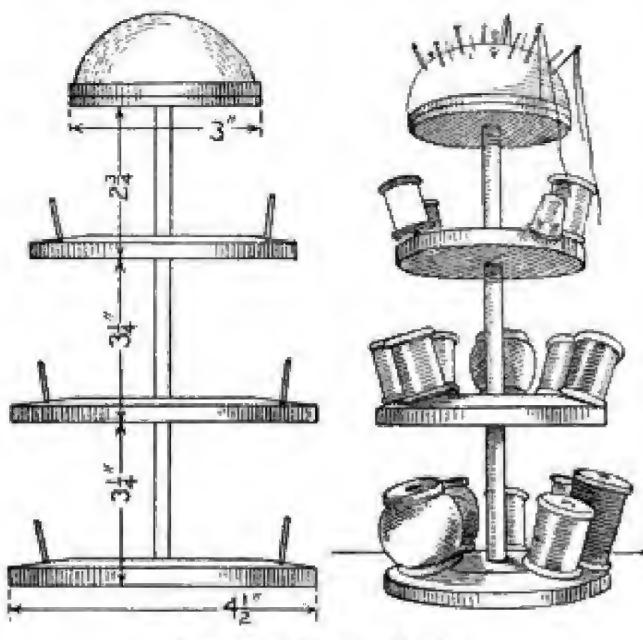


A Temporary Heater

some furnaces, the heater must be shaped a little differently, and the number of burners depends upon the amount of steam needed.—Contributed by G. H. Hill, Montclair, N. J.

Pincushion and Spool-Holder

An ornamental as well as a useful article for the sewing room is shown in the sketch. When made up and finished in the wood the same as the other furnishings of the room, it will have a neat appearance.



Spool and Needle Holder

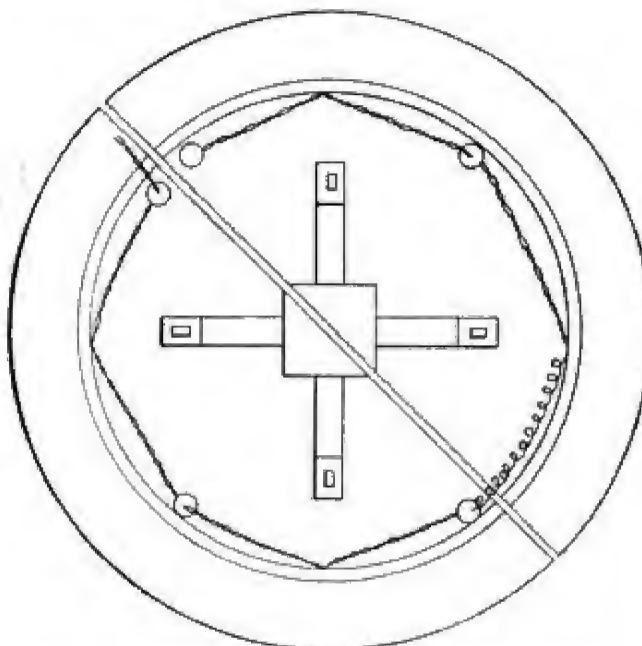
The center post is made of a $\frac{7}{8}$ -in. dowel which is glued into the mortise of the base. The small pins are made of $\frac{1}{4}$ -in. dowels and six or eight are set into each block. The cushion block is made of two thin pieces, the cushion being made over one and this nailed or screwed to the other before gluing it to the center post.—Contributed by Mrs. Carrie E. Dilly, South Haven, Michigan.

Removing a Stubborn Nut

Heat an open-end wrench that fits the nut and while hot place it on the nut and allow it to remain for two or three minutes, says the American Machinist. The heat will cause the nut to expand and it can be taken off with ease. A heated wrench gives much better results than a blow torch, as the torch will heat the nut and bolt at the same time, where the hot wrench only heats the nut. Any nut which resists the hot wrench will probably have to be split to take it off.

Electric Connections for a Dining-Room Table

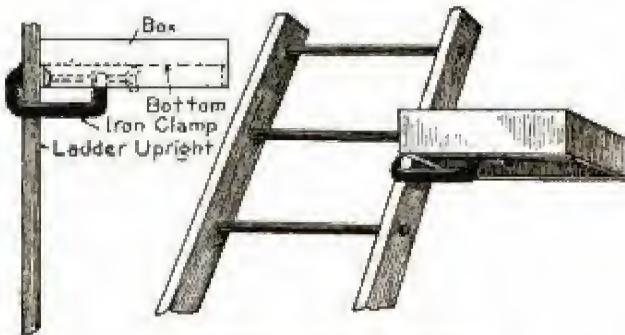
The many electric devices for cooking a hasty meal have brought about conditions that must be considered when wiring for the electric current in



bored through for the spokes. The spokes are made of hickory, $\frac{3}{8}$ in. in diameter. They are fastened with brads and glue. The completed wheel is shown in Fig. 2.—Contributed by F. W. Stromer, Gig Harbor, Wash.

Sign Painters' Shelf for a Ladder

I recently saw a sign painter using the device shown in the illustration to hold his materials while working on a ladder. The bottom of the box was placed far enough up to permit an iron clamp to be placed underneath and against the end piece. This clamp fastened the box securely against one of the uprights of the ladder. The box



Sign Painters' Ladder Bracket

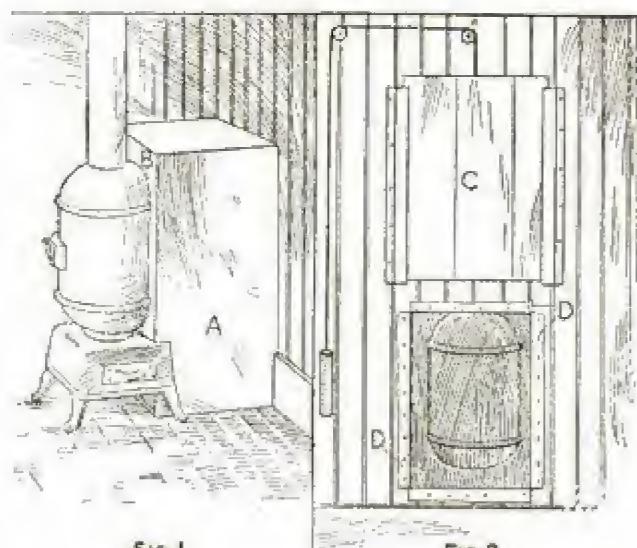
can be placed on either side.—Contributed by J. M. Kane, Doylestown, Pa.

Heating Two Offices with One Stove

In many business places which include a private office and a general waiting room, it is a problem to heat both these rooms effectively with one stove, at the least expense.

The accompanying sketch shows a simple method which has proven satisfactory. Make a connection from any kind of stove through the wall or partition behind the stove with sheet iron, A, Fig. 1. Insert the box-like form from the adjoining room so as to be able to have a turned-back edge (D, Fig. 2) left in the room to be heated, through which to drive nails to hold it in place. Bend and trim the sheet iron at B, Fig. 1, to fit the stove.

The heat is regulated in the inner office by a sliding lift door (C, Fig. 2),

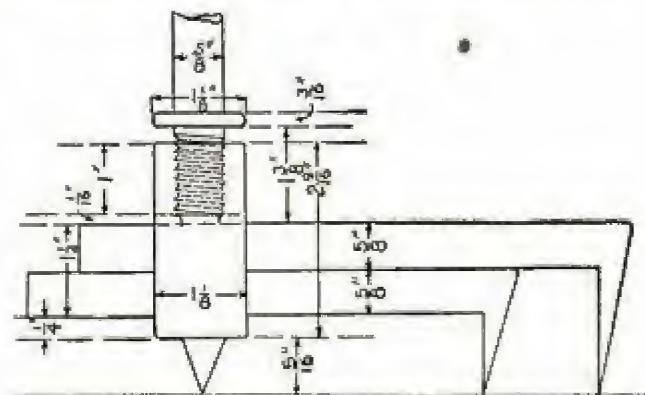


Heat Box on the Stove

which slides in grooves at each side. The door can be raised with a cord and weight, or by having a cord run to some convenient place in the office.—Contributed by Dr. D. D. Smith, Sandusky, O.

A Gasket Cutter

The detailed sketch shows an inexpensively made gasket cutter that may be used extensively in many shops. The tool may be of any size and proportion consistent with strength requirements. With the shank fitted to a drill press in the shop, or in a hand brace, it will quickly pay for the trivial expense of its manufacture, both in speed and the quality of work it will do.



Details of Gasket Cutter

This tool can be used to cut gaskets from almost any material with the exception of metals.—Contributed by F. W. Bently, Jr., Huron, S. Dak.

How to Weigh an Automobile

The best way to ascertain the weight of a car is to take it to the public weigh scales and, if possible, place it so that the four wheels rest on the scales as shown in Fig. 1.

the combined weight obtained by weighing the car as shown in Figs. 2 and 3 should give the total weight obtained by the method used in Fig. 1 to within a few pounds, but the weight

carried on each of the four wheels is by no means one-fourth of the combined weight. The reason of this is that different bodies are of different weights, and the position of the body and seating capacity has a bearing on the amount of weight thrown on the front and rear wheels. Take, for instance, seven-seated limousine and two-seated runabout bodies that are used on the same chassis. The tires that are just large enough for the latter will be quite inadequate for the former, but the cost of upkeep on the runabout will be decreased if it

tires that are large enough for the limousine, although if detachable rims are fitted, a tire of smaller section could be used if desired. However, the cost of the rims would not compensate for the difference in price of the two tires.

To See Bearings in Fine Die-Cutting

I am a die-maker on watch work, the finest class of work known, and our dies have to be absolutely in perfect alignment. It has been the general custom heretofore to use Prussian blue to enable the cutter to see the bearings. Recently, however, one of our men discovered a new kink which has, with us, superseded the old method. Having a gas flame burning low and red,

FIG. 1

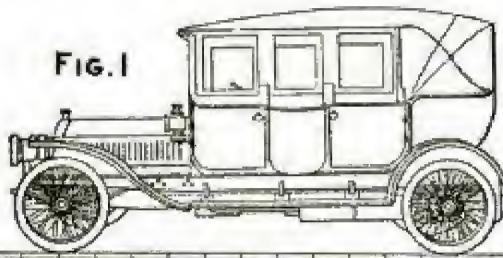


FIG. 2

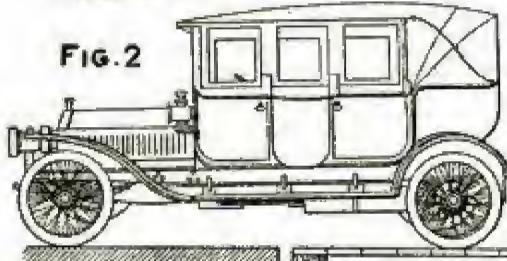
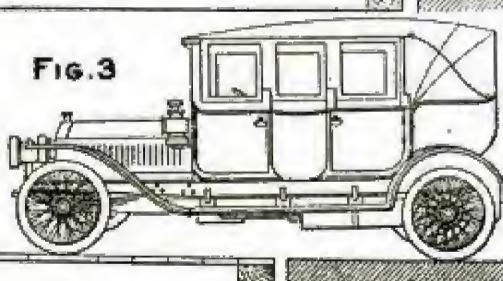


FIG. 3



Three Positions in Weighing

Sometimes this is not possible, owing to the great length of the wheelbase and the shortness of the scales, says the Automobile. In any case, the car should be fully equipped with all accessories—spare tires, full tanks, water, oil and gasoline, and each seat that can be occupied filled with a passenger, for reasons that will be made clear. Of course, if the car can be weighed on the scales with both front and rear wheels resting on the bridge, to obtain the total weight it is only necessary to add 150 lb. average for the number of passengers the car will carry, but this does not give the weight per axle or per wheel—the important point in determining the proper size of tires.

It can first of all be assumed that

he accidentally stuck the punch into the flame and thereby got a fine black coating on it. He tried that with the intricate cut he had in hand, and since then we have never used anything else. It is the best thing ever discovered for this purpose, for with it one can find bearings which could never be found any other way. Simply turn the gas down low without any blue flame, turn the punch around a few times, and you get a thin, fine black coating which will show the bright at the slightest touch, and give you every bearing perfectly.—Contributed by J. L. Van La Walker, Springfield, Ill.

Preventing a Bottle from Tipping Over

The bottoms of bottles or small vials commonly used for holding medicines, extracts or chemicals are so small com-

pared with their weight that they are liable to be overturned and the contents spilled.

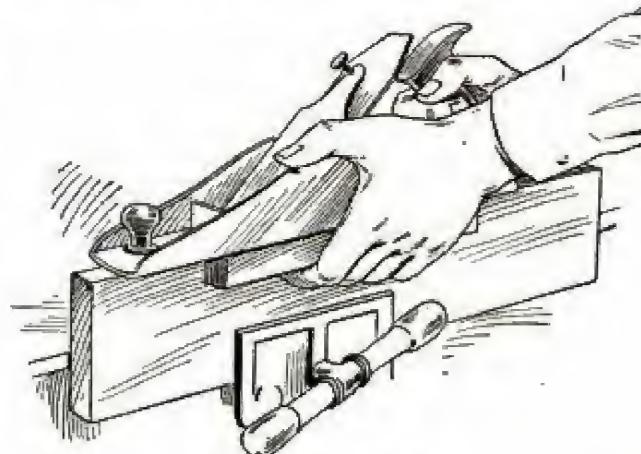
A simple expedient to make them more secure is shown in the sketch. The device consists of several pieces of tin about 2 in. long bent at right angles with a pair of pliers. Place

three of them on a round vial at equal distances apart and use four on a square or rectangular-shaped bottle. Bind them tightly with a thread or twine as shown. This will make a base that is secure, and the bottle or vial will slide on a surface before it will tip over.—Contributed by C. S. Browne, Lowell, Massachusetts.

Planing the Edges of a Board Square

A time-saving method of planing the edge of a board square is to place a perfectly square block of wood on the bottom of the plane near the left side for a guide and holding it with the left hand, as shown in the sketch. This forms a vertical surface true with the

surface of the board and holds the edge of the plane-iron at right angles. A little practice in holding the guide un-



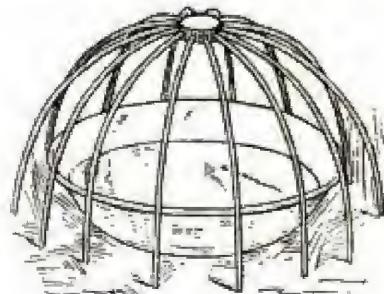
Holding Block on Plane

der the plane will enable one to plane the edge of a board perfectly true.—Contributed by J. J. O'Brien, Buffalo, New York.

Keeping Drinking Water Clean for Chickens

Cut several lengths of No. 9 wire about 24 in. long and secure them to a board in such a way as to form a circle of radiating wires from a center point similar to the spokes of a wheel. Melt some lead and pour it into the center, and when cold the wires will be fastened

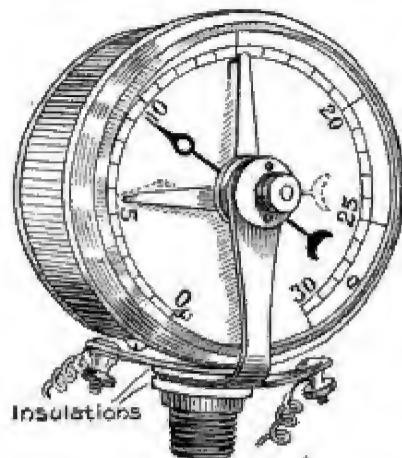
together. Bend the wires in a shape similar to the ribs of an umbrella and set the device over the pan of water, as shown in the sketch. The wires will prevent the fowls from stepping into the pan and give them plenty of room for their heads, when they want to drink.—Contributed by Otto J. Kling, Youngstown, Ohio.



Best results are obtained from hose nozzles made from 6 to 10 times the hose diameter in length, with the hole at the end one-third the hose diameter.

A Steam-Gauge Alarm

On low-pressure boilers where the attendant is required to do other work away from the boiler room, the electric alarm attachment for the steam gauge shown in the accompanying sketch



will prove quite valuable. The ordinary alarm attachment provides only for the ringing of the bell when the pressure is either too high or too

low. The one shown not only gives an alarm under either of these extreme conditions, but can be set at any desired pressure instantly. The one shown in the sketch is set for giving the alarm when the high pressure reaches 15 lb. and the low pressure drops to almost 5 lb.

The position of the pointer shown by the dotted lines makes the contact for closing the electric circuit. The thumbnuts for setting the contact points are attached to a piece of brass extending over the edge and glass face of the steam gauge. The glass, being a non-conductor of electricity, provides a way to hold the contact points clear of the metal of the steam gauge. A hole is drilled through the glass in the center for the stems of the thumbnuts. The parts are insulated on the stem as shown.—Contributed by Herman Oenning, Chicago.

Marking Iron in a Structural Shop

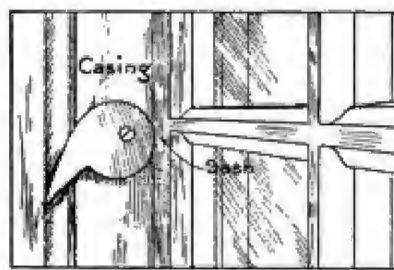
The following method of marking iron will be found very valuable in locating material, saving the fitter's time and saving crane service.

Instruct the layout men to mark all iron as near to the right as possible. The fitter, knowing that all the iron is marked at the right end, can place

it in position for assembling on the skids, thus saving the time it takes to check up and turn some pieces end for end. As all structural shop men know, a fitter will get his iron on the skids, then, after the crane has gone to some other work, he will check up his work and find some of it must be turned. This means a loss of time waiting for the return of the crane. The layer-out must stand while looking at the iron in the same relative position as when looking at the drawing, in order to locate the right end.—Contributed by Edwin J. Knapp, Cleveland, O.

A Window Sash Stop

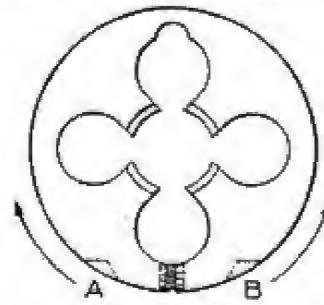
The accompanying illustration shows a small device to take the place of an ordinary window stop. It is made of



soft wood cut out with a knife. If a more substantial stop is wanted, it may be made of metal. When two are placed, one on each side of the window casing, one as shown and the other turned over in a reversed position, they will hold the sash immovable.—Contributed by Lily M. Norrell, Blythe, Ga.

Correct Way to Use a Die

There is a right and a wrong way to use dies as with everything else. You have perhaps noticed that a die seems to work harder and to dig up the threads more at one time than at another. This refers to the round solid type that is split on one side and has a round countersunk hole on each side of the split



to receive the driving screw from the die stock. If the screw is put in hole A when run on the work and in hole B when backing off, a big difference will be observed. A moment's thought will convince you that this is the logical way, as the natural drag of the die will keep the side opposite the screw from pulling in on the work, and the position of the screw keeps its own side from crowding.—Contributed by D. A. Hampson, Middletown, N. Y.

Fastening a Hasp from the Inside of a Door

A good way to fasten a hasp or latch to a door and make it impossible to be removed when locked is shown in the sketch herewith. A narrow slot is cut through the door about $\frac{1}{4}$ in. from the edge and the tongue of the hasp inserted as far as it will go. It is then bent around as shown in Fig. 1 and fastened with screws from the inside. All the screw heads are on the inside or covered as shown in Fig. 2. It cannot be taken from its place but by removing the padlock.—Contributed by Chas. Homewood, Waterloo, Iowa.

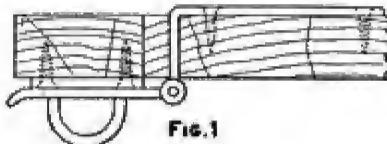


Fig. 1

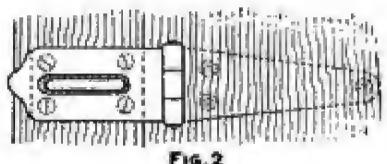


Fig. 2

Turnbuckles for Aeroplane Bracing

While building a helicopter I needed a lot of small, light turnbuckles, says a correspondent of *Scientific American*, and not being able to obtain anything suitable, I made them out of bolts and wire as illustrated in the sketch. They were made of No. 14 soft steel wire and an ordinary $\frac{1}{16}$ -in. stove bolt. This

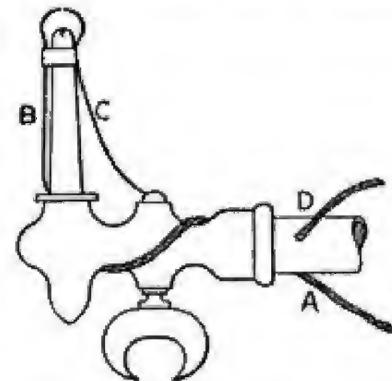


Wire and Stove-Bolt Turnbuckle

turnbuckle will easily stand a strain of 200 lb.

To Make an Electric Gas-Lighter

The electric gas-lighters now on the market are generally high-priced, but here is one that can be easily made at little or no cost. An insulated wire, B, is brought from the battery and wound around the fixture, the end being brought up and bent over the tip, as shown in the diagram. The wire may be held in place at the top of the tip by tape, but care must be taken to keep it well insulated from the fixture.



The screw which holds the key in place turns every time the gas is turned on or off. In the slot of this screw is soldered a piece of heavy copper or brass wire, C, which is bent over so as to come in contact with B when the gas is turned on. The contact should be broken just before the gas is turned full on, so that when the gas is burning the two wires are a little distance apart. If these two wires were kept in contact, the battery would soon run down. To complete the arrangement, a wire is grounded on the gas pipe somewhere near the battery. This should be soldered to the pipe to make a good connection.

Electric lighters like this have been in use by the writer for more than six months and give good satisfaction. If the flame is arranged to burn across the plane of the two wires, they will not burn or become coated with soot, although that can be easily wiped off.—Contributed by George Heimroth, Brooklyn, N. Y.

When laying out six holes or dividing a circumference or circle into six equal parts, the straight-line distance is half the diameter—that is, the dividers should be set to the radius of the circle.

Forcing Lubrication by Centrifugal Force

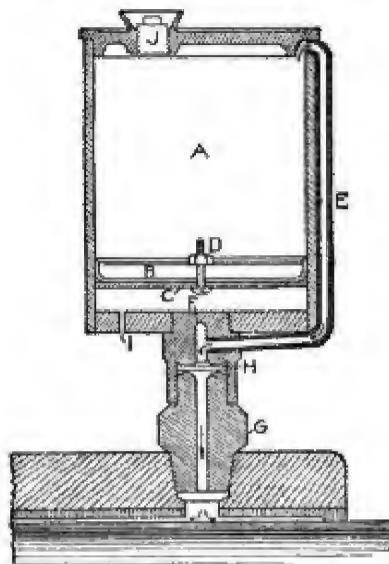
If the ordinary oil or grease cup is used on a loose pulley, it will not allow the grease to feed on the shaft when the wheel is in motion. This is due to the centrifugal force which tends to keep the oil pressed against the top or cover of the cup.

If a small pail is filled with water and swung in a circle in any plane, not a drop of the liquid will be spilled, provided the velocity exceeds a certain value. The oil in the

ordinary oil cup acts the same way when the cup is rapidly rotated. In the accompanying sketch a cup is shown which I have made to use the same force (centrifugal force) to force the oil into the bearing.

The cup is made of any straight-bored cup with a tight-fitting cover, but instead of feeding from the bottom it feeds through a separate pipe, E, whose upper end is attached as near the top as possible. This pipe leads around the cup and into the plug F, which screws into the bottom of the cup. The plug F is blind on the cup side and screws into the plug G, which in turn fits into the hub of the pulley to be oiled. Between the plugs F and G is fitted a diaphragm, H, which is made of sheet lead or soft copper and has a very small hole in its center.

The cup is fitted with a piston, B, which is also made of lead. A cup leather is used over the lead to make it oil-tight and a plate, C, bolted on with a stove bolt, D, whose upper end projects sufficiently to form a stop against the cover of the cup to protect the leather.

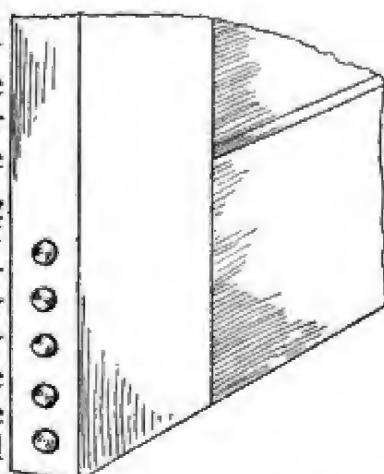


The action is simple, as the centrifugal force tends to throw the oil and the piston to the top of the cup. The oil exerts pressure on account of its own centrifugal force, but, as it cannot get away all at once, the pressure of the piston also helps to force it in the course taken by the arrows and then through the hole in the diaphragm H, and on the bearing to be oiled. The size of the hole in the diaphragm varies with the conditions of the pulley to be oiled. High-speed pulleys will naturally have a higher pressure on the oil, therefore they need a smaller aperture to obtain the necessary flow of oil. It is necessary to have a vent, I, in the bottom of the cup to relieve the vacuum under the piston.

This cup has the advantage of feeding only when the pulley is in motion, the only time it needs oiling.—Contributed by L. S. Bunker, Vallejo, Cal.

Preventing Rats from Gnawing through a Door

Rats and mice usually gnaw a hole through a door at one of the lower corners, as the angle of the crack allows space for breaking away the wood. The rodents can be prevented from gnawing by driving several finishing nails into the wood, as shown in the sketch.—Contributed by W. E. Cleveland, Chicago, Ill.



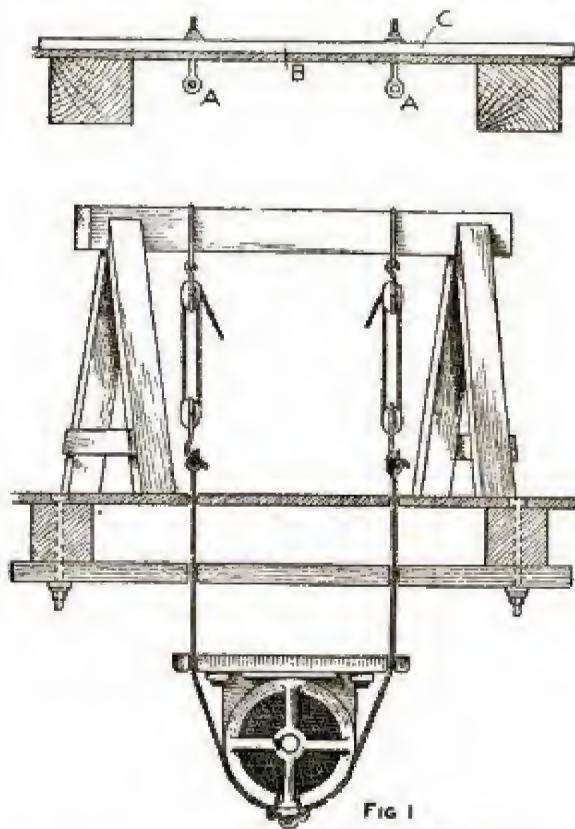
The motorist having need for a funnel when on the road can use the horn as a substitute. It requires but a minute's time to remove the horn from the car, disconnect it and take out the reed.

Raising Inverted Motors

Under certain conditions the method shown in the illustration will be found excellent for raising a motor to its intended place on a ceiling, says Electrical World. The tackle is arranged as shown in Fig. 1. The motor is raised with two ropes, each of which passes through a bedplate bolt hole and over the motor, and is fastened to the eye-bolt in the top. The two holes used for the ropes are the ones at diagonally opposite corners. After being made fast to the motor, the ropes are run

can be removed when the motor is in place. When the motor is drawn up against the stringer pieces, two bolts are inserted in the open holes and the nuts are set tightly. The hoisting ropes are pulled out and the other two bolts inserted.

When using this method, it is not necessary to cut large holes in the floor. The stringer pieces through which the holes are bored for the motor supporting bolts are bolted to the beams. Each hole should be $\frac{1}{8}$ in. greater in diam-



Hoisting an Inverted Motor into Place

through two of the four holes which have been bored through the stringer pieces for the bolts to hold the motor. The ropes are then run through two holes accurately located in the floor above. The plan of the motor base with the diagonal holes located on the line ED is shown in Fig. 2.

The hoist is arranged so that it is directly over the two holes in the floor through which the hoisting ropes pass. Instead of using a horse to support the tackle, it is sometimes best to arrange temporary eyebolts in the floor next above, as shown at A, A. These bolts

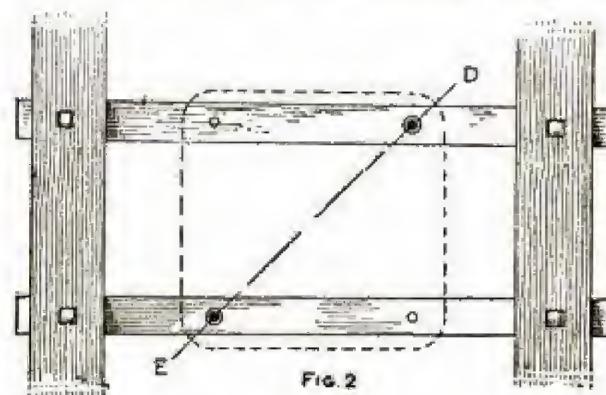


FIG. 2

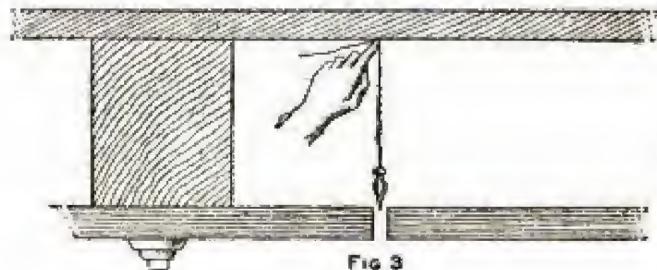


FIG. 3

eter than the diameter of the supporting bolts. A long bit can be used for boring the two holes for the hoisting ropes through the stringer pieces and the floor. If such a bit is not at hand, the locations of the floor holes can be accurately determined with a plumb bob, as shown in Fig. 3. The floor holes should be large enough to prevent the rope from binding in them.

Iron will show red at 1,000 to 1,300 deg. F., according to the light, and at 700 deg. in the dark.

A Rural Mail-Box Post

The accompanying sketch shows a rural mail-box post I made, which rests on the ground instead of being set in a hole.

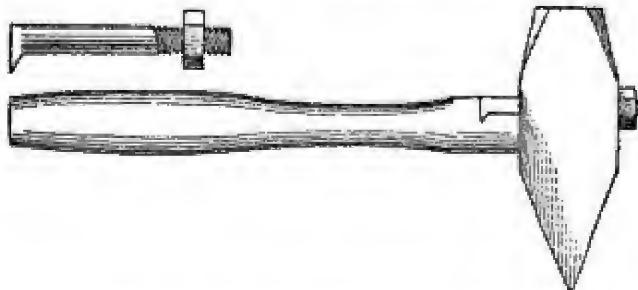
I have moved twice since this post was made and it was easy to place on a load with the household goods.

The post is made of 2-in. by 4-in. material, each piece of the triangle being 2 ft. long and the upright $4\frac{1}{2}$ ft.

high. The braces are $\frac{5}{8}$ -in. by $2\frac{1}{2}$ -in. material, 46 in. long. The block, to which the box is attached, is bolted to the upright so it can be raised or lowered to suit the convenience of the carrier.—Contributed by O. H. Albaugh, Chesterland, Ohio.

Holding a Hot Cutting Chisel on a Handle

The wood handle of a hot cutting chisel burns from the intense heat and in time the head will become so loose from the shrinking wood that it will slip off when struck a glancing blow. The illustration shows a little device that will hold the chisel and handle together,



Bolt for Holding Hammer on Handle

no matter how the wood is charred or shrunk. The method of construction

is obvious and does not need further explanation.—Contributed by Walter W. White, Denver, Colo.

Foot Support for Ladders

Painters and others who work on ladders know how exhausting it is to stand on a rung for any length of time without tiring the feet. One painter overcame this difficulty by making a pair of supports to fit on the soles of his shoes as shown in the sketch. They were made of hardwood, each having two metal clamps screwed to the sides. A strap passes under the support and through the clamps to hold the support against the sole of the shoe.

The device will be a little troublesome when used the first time, but the wearer will soon learn to lift his foot a little higher in climbing a ladder. They will prevent the feet from slip-

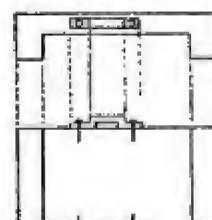


FIG. 1

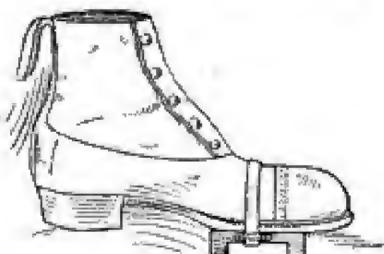


FIG. 2

Support on Shoe

ping on the rungs, but the main advantage is the way they rest the feet and limbs, as the weight of the body is supported on a much larger area of the shoe sole.—Contributed by James E. Noble, Toronto, Canada.

How to Repair a Canvas Canoe

A good repair job on a modern canvas canoe is sometimes hard to make as it usually leaves a bulge in the canvas over the repaired spot. The exact method of procedure depends on the nature of the hole.

If the defect is only through the canvas, it may be repaired in this way: Pull the canvas loose from the wood for about 2 in. all around the hole and apply a little thick shellac. Next slip a piece of good silk under the hole and

see that it is placed smooth. As soon as the shellac becomes sticky, push the canvas down on the silk as smooth as possible. When the shellac is dry, fill up the crack between the edges of the canvas with a good grade of thick waterproof glue or white lead. When dry, sandpaper and paint. This makes a repair that can hardly be detected.

If the wood is broken, it must be repaired first with either a piece of wood or a thin piece of sheet copper placed over the hole between the wood and the canvas. The space between the copper and the ribs should be filled with wax or some like substance. When this is done, proceed as previously described.—Contributed by L. C. Helm, E. Lansing, Mich.

Removing a Tight Wood Screw

A screw that has been in the wood for some time is difficult to remove. The more you try to turn it with a screwdriver the worse it gets, and the head is liable to be damaged. Much time and trouble can be saved by heating a rod to a cherry red and placing the end of it on the screw head. Keep it there until the screw has become heated. Allow the screw to cool and then remove with a screwdriver. The expansion of the metal caused by the heat makes the hole larger, and when the screw has cooled and contracted to its normal size, it can be easily removed.—Contributed by Horace A. Person, Washington, D. C.

Heating Water in a Church Baptistry

There were no arrangements made for heating the water in the baptistry of our church, so the following plan was tried out and worked just as efficiently as a high-priced plant. A water coil heater, E, was made of pipe and fittings and connected to the water-main pipe A and the pipe for emptying the baptistry B, by two pieces of hose, C and D.

After the fire in the furnace burned to coals, the heater E was put in through the door as shown. The water

was allowed to run slowly from the main A and through the coil. Starting this heating device early in the day, the

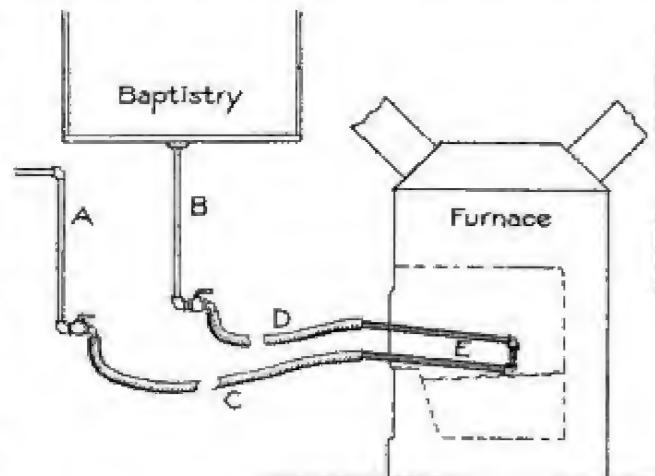
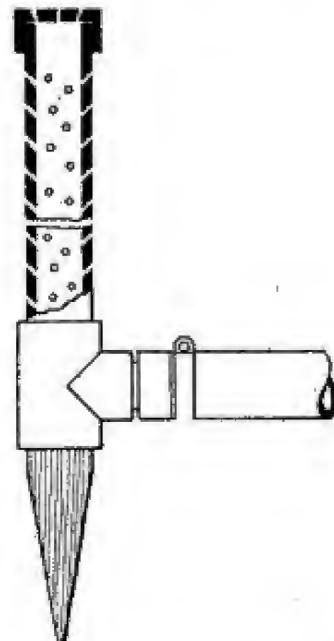


Diagram of Connections

baptistry would be full of warm water for the evening service.—Contributed by Frank H. Morse, Maplewood, Mo.

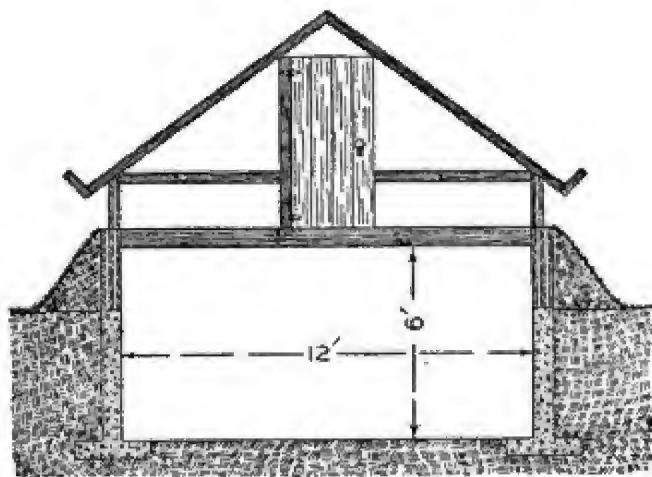
A Home-Made Lawn Sprinkler

An inexpensive and easily constructed lawn sprinkler is shown in the accompanying sketch. Secure a piece of 1-in. pipe, about 2 ft. long, and thread it at both ends. On one end screw a cap, as shown, and on the other end, a pipe tee which is tapped to receive a hose connection. Drill a number of $\frac{1}{8}$ -in. holes slanting upwards, in the pipe, as shown. A sharp pin, made of wood and fastened in the tee, serves to hold the pipe upright in the ground. This sprinkler will give as good service as any you can buy and costs less. It is also durable as there is nothing about it that can get out of order.—Contributed by C. C. Brabant, Alpena, Michigan.



A Cellar for Cold Storage

When keeping my dahlia roots in my home cellar which contains a hot-air furnace for heating the house, I lost



Sectional View of Cellar

many roots by drying and I was forced to get them outside, says a correspondent of *Country Gentleman*. I designed a cellar for keeping the roots as well as to furnish a place in which to work on sunny spring days. The roof is made of glass which covers the greenhouse part, this being set over a cellar dug in the earth.

The floor was put in loosely with the supposition that the warm air from the cellar would keep the greenhouse from freezing, but instead it helped the cellar to freeze. A small oil stove was sufficient to keep the temperature right during cold snaps in the spring. Such a cellar must be provided with proper drainage in localities where it is necessary.

Emergency Repair on a Broken Cylinder Head

In case of a broken cylinder head, the following method of emergency repair has by actual test proven satisfactory, although at first sight it is seemingly impractical. Take a piece of tin and cut it the same size as the cylinder head and punch holes for the stud bolts. Fit a piece of hard wood, 3 or 4 in. thick, on the head of the cylinder, allowing 2 or 3 in. to project all around, to prevent the bolts from splitting out. Bore

holes for the stud bolts, marking their positions from the broken pieces of the cylinder head. Make new stud bolts long enough to extend through the packing tin and the wood, with nuts and wide washers. Pack carefully between the tin and the cylinder with any good sheet packing and use care in tightening up the nuts evenly all around. I have seen a locomotive use this repair on one cylinder doing heavy work for more than one week, or until permanent repairs could be made.—Contributed by D. Bittenbender, Northwestern, Cal.

How to Harden and Temper a Lathe Tool

Many persons can forge a perfect lathe tool but, for some reason, have trouble when they undertake to temper it. I have many times noticed lathe tools with the cutting edge nicked or broken about $\frac{1}{2}$ in. from this edge.

An inside boring tool is shown in Fig. 1. When hardening this tool, it is not good practice to hold it as indicated by the dotted line C while in the cooling bath. Heat it to the hardening temper up to this line, and plunge the entire tool, cutting edge down, in the bath. This will prevent breaking off the short end. Polish the tool as far back as the line C. Heat a pair of tongs to almost white heat, and place the tool between the jaws, as shown by the dotted line B. The size of the

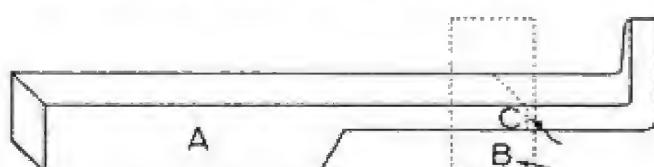


FIG. 1

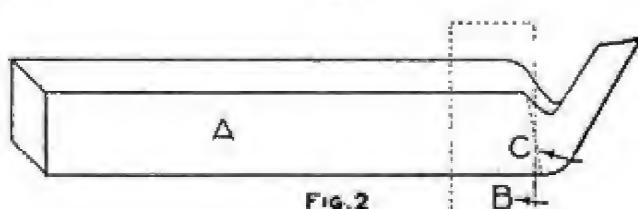


FIG. 2

Tempering Lathe Tools

tongs will, of course, depend on the size of the tool. The hot tongs will

cause the temper to be drawn even, and the tool will be soft enough to file a short distance back from the cutting edge.

In most cases the temper should be drawn to a light blue and cooled in a bath of clear cold water with a quantity of salt added to make a brine. In Fig. 2 is illustrated the same method applied to a diamond-point tool.—Contributed by J. N. Bagley, Webber, Kansas.

Treating a Cracked Hoof

The proper place to stop the movement of a cracked hoof is at the top of the crack where the new horn is being formed at the coronary band, says the American Blacksmith. The thing to

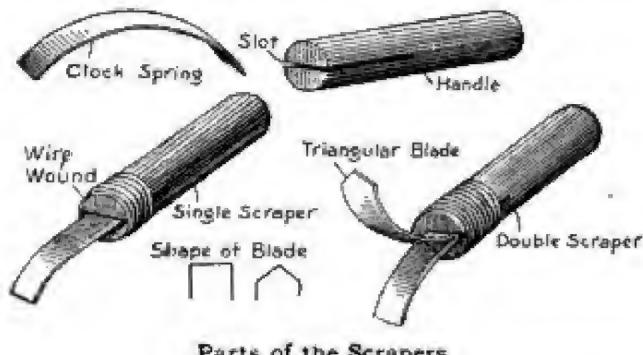
do is to cut a groove down through the horn on each side of the crack and about $\frac{5}{8}$ to $\frac{3}{4}$ in. from it, at the top, and coming to a point about $\frac{1}{2}$ in. down the hoof. This will form a V-shaped line with the crack in the middle, as shown in the sketch. Clamp the V-shaped part of the hoof about half way up and draw a hot iron deeply across the top of the V, just above the horn.

Any flat, ordinary or bar shoe will do, if the bottom of the hoof is properly leveled. A clamp or two may be put in below the V. If the horn is kept at work, it will not grow together again. The object is to keep the part where the new horn is being formed from moving, and by practically isolating it from the other part of the hoof, nature is given a chance to do the work under most favorable circumstances.

A Steel Scraper

The steel scrapers shown in the accompanying illustration are made of stout pieces of clockspring, inserted in slots sawn in short wooden handles. They are handy for removing dirt and grease from machinery or old paint

from uneven surfaces. The scraper blade is secured by wiring the handle or using a ferrule. Scrapers of various

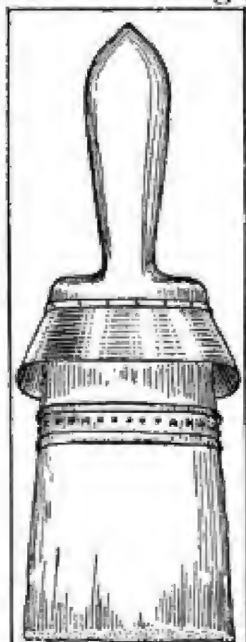


Parts of the Scrapers

degrees of strength and flexibility can be fashioned from different sizes of springs. The double scraper has a triangular-edged blade added for use on carved or indented surfaces.—Contributed by James M. Kane, Doylestown, Pa.

Keeping Paint from Running Down a Brush Handle

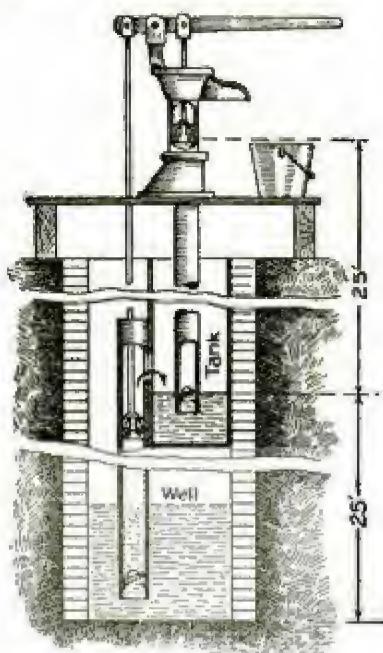
When painting a ceiling or overhead work the paint will run down through the bristles of the brush and onto the handle, making it disagreeable for the workman. I made an attachment as shown in the sketch for catching and holding any surplus color coming from the brush. The attachment is made of tin, funnel-shaped and nailed at the top edge of the metal around the handle. If tight joints are desired, they may be soldered. The paint caught in this cup will run back into the brush when it is held with the handle up.—Contributed by Ben Hemerka, Shamokin, Pa.



Work being turned on a lathe should never be allowed to "squeak" on the centers.

Doubling the Lift of the Suction Pump

It is well known that the height through which the ordinary suction pump will lift water is never much over 30 ft., and indeed rarely exceeds 25 ft. after some service, although the theoretical distance is nearly 34 ft. It is therefore somewhat of a novelty to find a suction pump having an effective lift of over 50 ft.



Such a pump was described in a recent issue of *Practical Engineer*. The explanation, however, is simple. Instead of using one suction barrel, two are employed in this case, the piston rods being attached one on each side of the pivot of the pump handle. The pump to the left elevates the water from the well about 25 ft., and discharges into a tank supplying the other pump, the water thus being relayed to the surface in two stages. It is obvious that the pumps must work at the same rates in order to obtain the best effect from the apparatus.

A Pipe-Cleaner That Is Clean

An ordinary bicycle foot-pump makes an effective pipe-cleaner and can be used without soiling the hands during the operation. Unscrew the stem of the pipe and insert in its place the nipple on the end of the pump hose. Then simply press down the plunger of the pump a few times, and all the accumulated "nicotine" and tobacco will be forced through the bowl of the pipe, rendering it sweet and clean.

The bicycle pump may also be used

to clean the tubes of a gas stove, by attaching it to one of the tubes or at the top of the burner with a section of small rubber hose. The air pressure will force out all the sediment from inside the burner and pipes.—Contributed by A. A. Houghton, Northville, Mich.

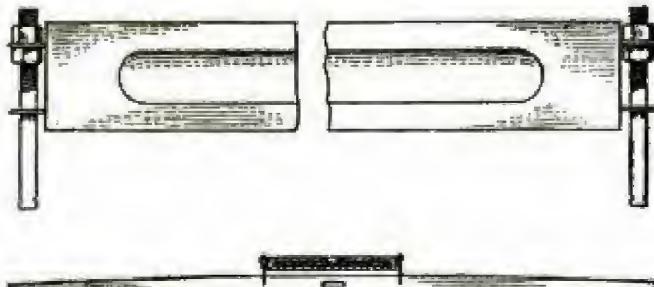
Cranking a New Automobile Engine

Engines on large automobiles when new or just after taking up the bearings are hard to crank by one man. In such a case, instead of wasting strength by trying it alone, loop a rope over the starting crank and get as many persons as required to give the first quick turn. When a magneto is the only means provided for furnishing the spark, this method is especially adapted, as the position may be advanced to where a good spark can be obtained at a slow speed and yet without fear of having a "kick back." The latter, if sufficiently violent, will simply pull the rope out of the hands.—Contributed by M. R. Wells, Cleveland, O.

Adjustable Level Fastenings for a Straightedge

The illustration shows a convenient level attachment for a straightedge. Setting the ends of the level to an angle with the straightedge by the bolts, an accurate grade can be secured for ditching and the laying of drain tile.

The straightedge should be carefully jointed on the lower edge and the bolts



Level on a Straightedge

fastened to its side with nails or screws in the notches. Screw eyes are used in the ends of the level for the adjusting bolts and nuts.—Contributed by Geo. H. Sogle, Riverside, Wash.

To Get a Natural View from a Photograph

In photographs, half-tone prints, etc., the pictured objects appear flat when viewed with the naked eye in the open light. To bring out the perspective and to have the objects appear in their natural positions, the same as when viewed through a large magnifying glass, a simple arrangement may be used. Take a piece of moderately stiff dark paper, say 12 in. square, and make it into the form of a cylinder having a diameter of about 2 in. View the picture through this cylinder, holding it up to one eye while the other is kept closed.—Contributed by L. Bogia, Philadelphia.

Locking Flat-Head Screws

After having considerable trouble with some flat-head screws coming loose on an automobile, I tried with success the following method of fastening them.

Each screw was turned up tightly and then the

position of the slot marked with a small sharp chisel. The screw was then removed and a small notch cut in the face of the countersunk hole. The screw was then replaced and part of the head driven down into the notch as shown in the sketch. This effectively locks the screw.—Contributed by Harry G. Fesenfeld, Black Earth, Wis.

How to Make a Pair of Shoe Trees

Obtain some soft pine blocks about 3½ in. long and 2 in. thick, cut them to the desired shape and sandpaper the surfaces smooth. In the center of the rear end of these blocks bore a ¼-in. hole, 1 in. deep, and glue a piece of reed or cane of the same diameter in it, making the whole thing some 2 in. longer than the shoe. Insert the block in the toe of the shoe and bend the reed into a bow with the free end pressing

against the inside of the heel. It is obvious that the extra length of the



FIG. 1

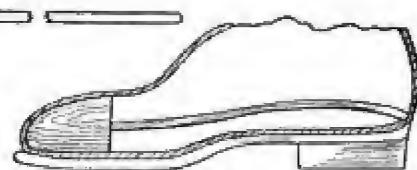


FIG. 2

Tree in the Shoe

reed will make the trees adjustable to the different sizes of shoes.—Contributed by Katharine D. Morse, Syracuse, N. Y.

Making Brass Castings a Bronze Color

Dissolve 1 lb. of sal ammoniac in about ½ gal. of water. Thoroughly cleanse and remove all grease from the casting and heat it until the metal becomes red. Then plunge it into the solution and remove it quickly so that it will cool in the air. The surface will take on a light golden color.—Contributed by Peter Matik, Everson, Pa.

Rubber-Hose Holder for Barrels

The end of an ordinary rubber hose will not stay in a barrel or trough if there is much pressure on the water running through it. The hose will have a tendency to straighten out under the pressure and fall from the barrel and wet things generally, besides wasting the water. In Fig. 1 is shown an attachment for a barrel, and in Fig. 2, the way it is used for holding the end of a hose. It is made of a strip of iron,

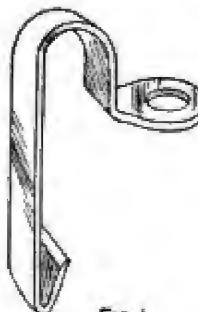


FIG. 1

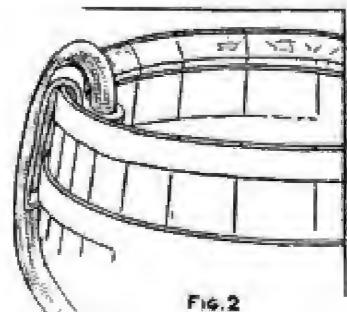


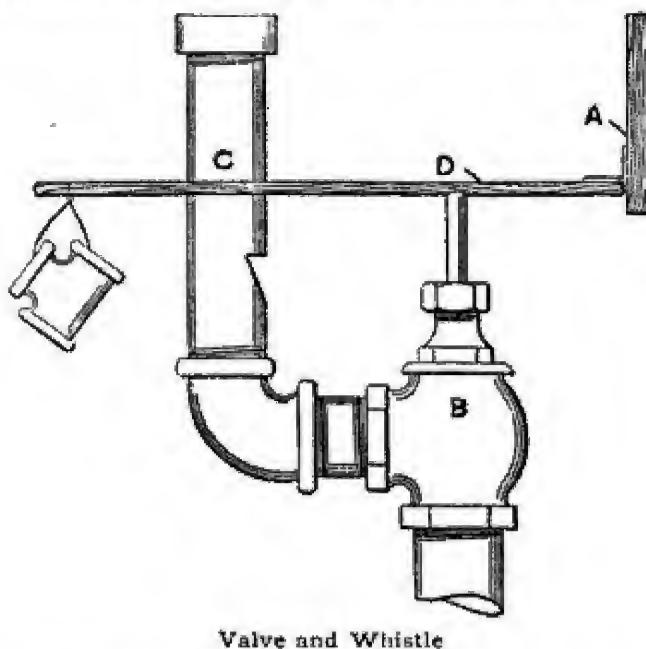
FIG. 2

Holder Attached to a Barrel

bent and sharpened at the bottom so it can be slipped under a hoop, and an opening made at the top to admit the hose.

A Safety Whistle

While visiting a small plant located in the country, I noticed the device shown in the accompanying sketch and questioned the engineer, who also acted



as fireman, concerning it, says a correspondent of Power. He stated that when the old safety valve gave out after 60 years' use on various boilers, his employer would not purchase another, as there was no compulsory boiler inspection at the time. He therefore became apprehensive as he was often obliged to leave the boiler room after making a new fire, and as a result frequently stopped work in another part of the building and waited for the crash.

Becoming tired of this he made the alarm shown in the sketch, and attached it to the boiler. The piece of plank, A, is nailed to the rafters above and to this is hinged the stick D, about 4 ft. long. The angle valve B has the thread filed off the stem and the wheel removed, the upper part of the stem bearing on the stick D, while C is a whistle made from a piece of pipe. The tee hung at the end of the stick serves as a weight for varying the pressure at which the whistle will blow. All the fittings and pipe are $\frac{1}{2}$ in.

With this device installed, when the pressure reaches the safety limit, the whistle blows and the engineer hurries to the boiler room and checks the fire.

Measuring Gasoline in a Tank

The use of a small glass tube will be found a simple and accurate method of determining the depth of gasoline contained in the tank of either an automobile or a launch. The tube should be about $\frac{1}{4}$ in. in diameter and long enough to project a few inches above the top of the tank.

Insert the tube carefully in the tank and when it touches the bottom, place the thumb firmly over the top of the tube and withdraw it. The depth of the gasoline will be clearly indicated by the gasoline in the tube.—Contributed by D. F. Southgate, Rochester, New York.

Air Blasts Across Spark Gaps

An air blast across the spark-gap of a wireless instrument is said to materially increase the efficiency of the transmitter. The spark-gap is kept cool and at a practically uniform resistance, which allows the transmitter to be used indefinitely without the spark varying in pitch. Gases formed by the oxidation of the metal by the air, and which allow brush discharges of lower potential to pass and give varying and rough notes in the spark are dispersed.

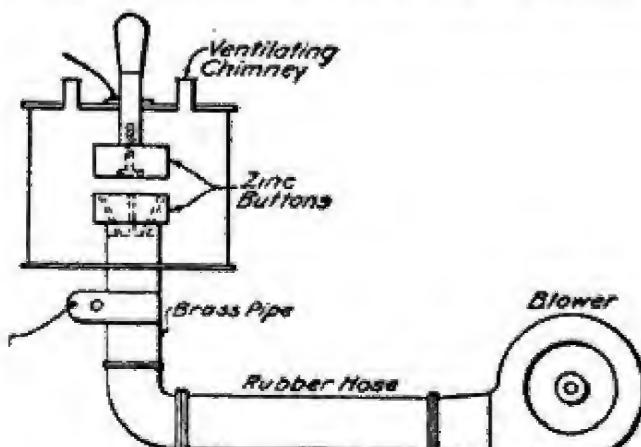


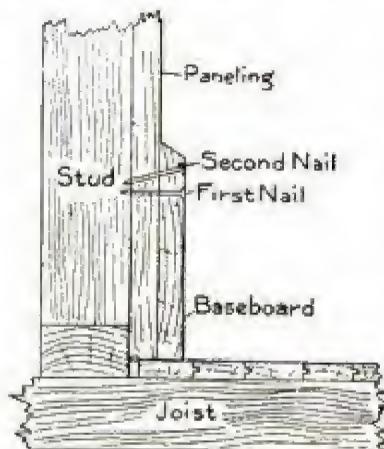
Diagram of Spark-Gap Air Blast

One means of providing an air blast is shown in the illustration. The gap proper consists of two zinc disks. The lower disk has a shoulder turned with a slight taper so that it will fit snugly into a piece of $\frac{5}{8}$ -in. brass pipe about 6 in. in length. Six holes are drilled

through the disk, these converging within the shoulder to form a passage for the air. A shoulder and length of rubber hose lead from the brass pipe to the blower. The blower starts automatically with the starting of the transmitting motor-generator set, and is placed outside the operating room so that its noise will not interfere with the receiving of signals.

Nailing Warped Boards

A great deal of trouble has been experienced by every carpenter in nailing baseboards that are warped and



nail home straight through the two boards at right angles to their surfaces and tapping it until the boards are drawn tightly together, then, before setting this nail, drive another home close to the other at an angle of about 60 deg. to the face of the board. Both nails can be set without danger of the boards springing apart.—Contributed by L. M. Hodges, San Jose, Cal.

Gauge and Vent for a Funnel

In pouring liquids into barrels or receptacles where the contents cannot be seen, the attachment for an ordinary funnel as shown in the sketch will prove advantageous. The small tube vents the receptacle being filled, and when full the wire indicator will rise. The tube is made of tin and soldered into the funnel. A stiff wire with a cork attached to the lower end is placed inside the tube. The cork is made smaller

in diameter than the hole of the tube. When the level of the liquid strikes



FIG. 1

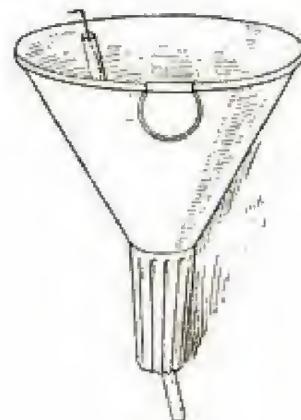


FIG. 2

Tube inside of Funnel

the end of the tube, the cork will float and carry the wire up, thus indicating that the receptacle is full.

An Eye Shade

The eyes may be protected from the blinding glare of a light by taking a piece of paper (8 by 11 in. is a good size), folding it in the center, inserting a rubber band in the crease and adjusting the rubber over the head with the paper hanging over the eyes.—Contributed by A. S. Allen, La Belle, Mo.

How to Make a Double Trouser Hanger

The hanger is made of a piece of heavy iron wire bent as shown in Fig. 1. The length of the wire used for each hanger is about 43 in. One pair of

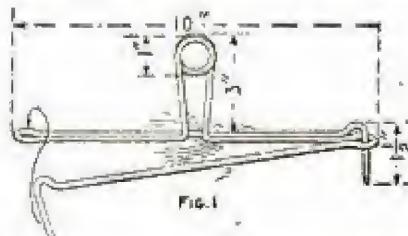


FIG. 1

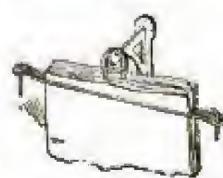


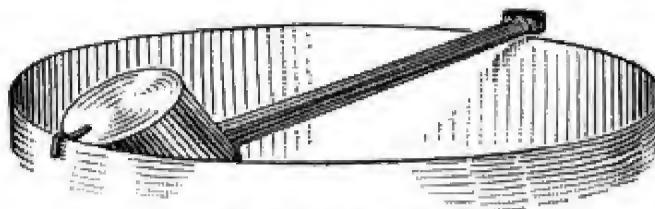
FIG. 2

Made of Wire

trousers can be clamped on each side of the hanger. The arrow shows the way the hook is inserted in the hole. The hanger in use is shown in Fig. 2.—Contributed by K. Kuga, Hoquiam, Washington.

Holding Dipper on a Vessel Rim

The person who handles paint, soft tar or oil in barrels, usually puts the dipper to drain on a board or on the



Hook on Dipper Bottom

edge of the barrel so that the liquid will get on the side of the barrel and on the floor. This is a nuisance, which can be avoided by simply soldering a hook on the bottom of the dipper. It can then be hung on the inside of the barrel as shown.—Contributed by W. A. Jaquythe, Richmond, Cal.

Etching on Glass

A very easy and cheap formula for etching on glass, given by Pottery and Glass, is as follows: Barium sulphate, 3 oz.; ammonia fluoride, 1 oz. To the foregoing is to be added enough sulphuric acid to decompose the ammonia fluoride and make a mixture of semi-fluid consistency. It must be prepared in a leaden vessel and kept in bottles coated inside with a thick layer of paraffin, beeswax or gutta percha, and closed with rubber stoppers. The mixture can be used for printing with rubber letters for stencils, and be thinned so as to use with a common pen. The fumes are poisonous, and contact with the flesh should be avoided.

All glass, even the hardest, may be etched, but highly alkaline glass offers the greatest resistance to the influence of acids. Hydrofluoric acid develops in gaseous form from fluorspar, when the latter, in finely pulverized form, is wetted with strongly concentrated sulphuric acid.

For this purpose, vessels made of materials not affected by the acid are used, such as lead, platinum, rubber and gutta percha. The etching is accomplished by coating the glass surface with beeswax, paraffin or other suit-

able resistant, and then tracing the design desired, whether letters, figures or scrolls, by means of a stencil. A suitable pencil is used to remove the resistant, while the acid etches only the uncovered part of the glass. For lettering, an oiled paper, such as used in stenciling match designs, makes as good a pattern as sheet steel, and is more readily and cheaply prepared.

For rapid work, the following formula will be found of service:

No. 1	
Fluor-Ammonia.....	1 lb.
Hydrofluoric Acid.....	0.5 "
Sulphuric Acid.....	0.1 "
Ammonia.....	0.1 "
Water.....	0.1 "

No. 2	
Fluor Soda.....	1 lb.
Sulphuric Acid.....	0.2 "
Water.....	4 "

No. 3	
Carbonate Ammonia.....	2 lb.
Sulphate Ammonia.....	1 "
Hydrofluoric Acid.....	1 "
Water.....	1 "

Such baths produce in five to twenty minutes, according to the purity and strength of the materials used, a silky frosting or matt etching. Before frosting, the glass should be cauterized for one minute by immersion in diluted hydrofluoric acid, rinsed in warm water and then put into the frosting bath.

Turning Large Screws with a Small Screwdriver

While driving a number of large screws with a small screwdriver, as nothing in proportion to the size of the screws was at hand, I found it hard to turn the screws after they were about half way in and was unable to turn them without splitting or spoiling the heads.

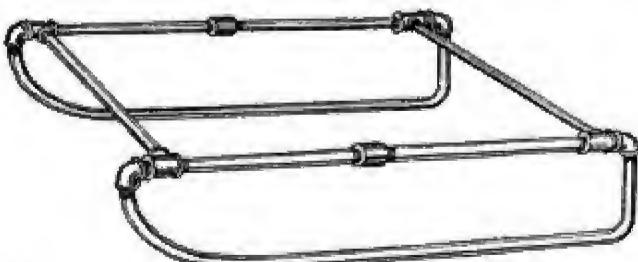
After spoiling several screws, I tried striking them a light blow with a hammer when unable to turn them farther and found that they could be turned easily. This did not injure the holding quality to any extent. These screws were placed in soft wood, but when striking them in hard wood there is some danger of splitting the wood. Experience will teach about how heavy a blow to strike.—Contributed by Felix Herz, Goldfield, Colo.

AMATEUR MECHANICS

Hand Sled Made of Pipe and Fittings

The accompanying sketch shows how an ordinary hand sled can be made of $\frac{3}{4}$ -in. pipe and fittings. Each runner is made of one piece of pipe bent to the proper shape. This can be accomplished by filling the pipe with melted rosin or lead, then bending in the shape desired, and afterward removing the rosin or lead by heat. Each joint is turned up tightly and well pinned or brazed. One of the top crosspieces will need to have right-hand and left-hand threads or to be fitted with a union. Also, one of the top pieces connecting the rear part to the front part of each runner must be fitted in the same way. The top is fastened to the two crosspieces.

Such a hand sled can be made in a few hours' time and when complete is



Parts Made of Pipe Fittings

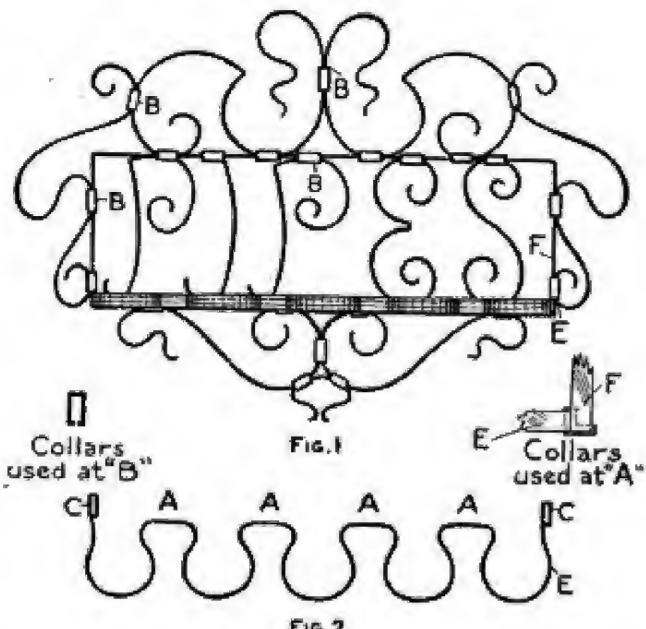
much better than a wood sled.—Contributed by James E. Noble, Toronto, Ontario.

Bent-Iron Pipe Rack

Strips of soft iron, $\frac{1}{4}$ or $\frac{3}{16}$ in. in width and $\frac{3}{16}$ in. thick, are used in making the pipe rack shown in Fig. 1. This material can be obtained from any local hardware dealer who carries bar iron in stock.

Draw a sketch of the design full size on paper, then run a string over each part, which when straightened out will give the length. The scrolls are bent

with a pair of round-nose pliers. These with a pair of flat-nose pliers



Design of a Rack

are all the tools necessary. The part for holding the pipes is shown in Fig. 2. The end elevation at E and F shows how the rack is fastened to the main frame of the back.—Contributed by J. W. Vener, Boston, Mass.

Emergency Magnifying Glass

When in need of a microscope for the study of botany, one may be made in the following manner: Bend a small wire or the stem of a leaf so as to form a small loop not larger than the ordinary drop of water. When this is done place a drop of clear water in the loop and the microscope is complete.

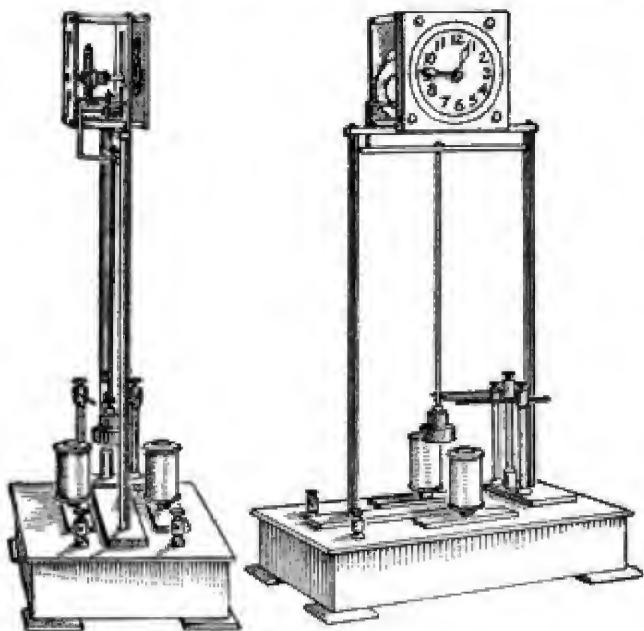


Loop Enclosing a Drop of Water

This temporary device will prove valuable where a strong magnifying glass is not at hand.—Contributed by Arthur E. Joerin, Paris, France.

Home-Made Electric Clock

The clock illustrated herewith is driven by means of electromagnets acting directly on the pendulum bob. Unlike most clocks, the pendulum swings



Magnetic Clock

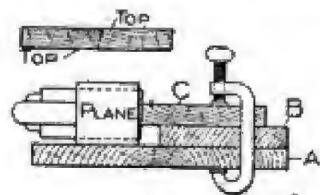
forward and backward instead of laterally. The construction is very simple, and the result is not only novel but well worth while, because one does not have to bother about winding a clock, such as this one, says the *Scientific American*.

The clock is mounted on a wooden base measuring $3\frac{3}{4}$ by $6\frac{1}{2}$ in., by $1\frac{5}{8}$ in. thick. Secured centrally on this base is a $\frac{1}{8}$ by $\frac{3}{4}$ -in. bar, 6 in. long and at each side of this, $\frac{1}{8}$ in. away, is an electromagnet, $\frac{3}{4}$ in. in diameter and $1\frac{5}{8}$ in. high. Two uprights, $7\frac{1}{2}$ in. high and $\frac{1}{4}$ in. in diameter, are secured in the base bar, and are connected at the top by a brass yoke piece on which the clock frame is supported. Just below the yoke piece a hole is drilled in each upright to receive the pivot pins of the crosspiece secured to the upper end of the pendulum rod. The pendulum bob at the lower end is adjusted to swing just clear of the electromagnets. Mounted at the right-hand side of the base are three tall binding-posts, the center one being $2\frac{3}{4}$ in. high, and the other two $2\frac{5}{8}$ in. high. Each is fitted with a piece of copper wire pro-

vided with a small brass spring tip. These springs lie in the plane of the pendulum, which serves to swing the central tip first against one and then against the other of the side tips, thereby closing the circuit of first one magnet and then the other. Each magnet attracts the pendulum until its circuit is broken by release of the center tip, and on the return swing of the pendulum the circuit of the other magnet is similarly closed. Thus the pendulum is kept in motion by the alternate magnetic impulses. The clock train is taken from a standard clock and the motion of the pendulum is imparted to the escape wheel by means of a pawl, bearing on the latter, which is lifted at each forward stroke of the pendulum by an arm projecting forward from the pivotal end of the pendulum rod.

Method of Joining Boards

The amateur wood-worker often has trouble in joining two boards together so that they will fit square and tight. The accompanying sketch shows a simple and effective method of doing this. Secure a board, A, about 12 in. wide that is perfectly flat.



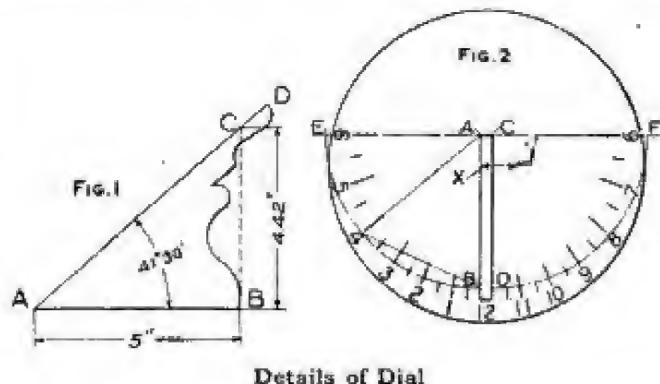
Fasten another board, B, about 6 in. wide, to the first one with screws or glue. Now place the board to be joined, C, on the board B, letting it extend over the inside edge about 1 in. and fastening it to the others with clamps at each end. Lay the plane on its side and plane the edge straight. Place the second board in the clamps in the same manner as the first, only have the opposite side up. If the cutting edge of the blade is not vertical, the boards planed in this manner will fit as shown in the upper sketch. In using this method, first-class joints can be made without much trouble.—Contributed by V. Metzsch, Chicago.

How to Lay Out a Sundial

The sundial is an instrument for measuring time by using the shadow of the sun. They were quite common in ancient times before clocks and watches were invented. At the present time they are used more as an ornamentation than as a means of measuring time, although they are quite accurate if properly constructed. There are several different designs of sundials, but the most common, and the one we shall describe in this article, is the horizontal dial. It consists of a flat circular table, placed firmly on a solid pedestal and having a triangular plate of metal, Fig. 1, called the gnomon, rising from its center and inclined toward the meridian line of the dial at an angle equal to the latitude of the place where the dial is to be used. The shadow of the edge of the triangular plate moves around the northern part of the dial from morning to afternoon, and thus supplies a rough measurement of the hour of the day.

The style or gnomon, as it always equals the latitude of the place, can be laid out as follows: Draw a line AB, Fig. 1, 5 in. long and at the one end erect a perpendicular BC, the height of which is taken from table No. 1. It may be necessary to interpolate for a given latitude, as for example, lat. $41^{\circ}30'$. From table No. 1 lat. 42° is 4.5 in. and for lat. 40° , the next smallest, it is 4.2 in. Their difference is .3 in. for 2° , and for 1° it would be .15 in. For $30'$ it would be $\frac{1}{2}$ of 1° or .075 in. All added to the lesser or 40° , we have $4.2 + .15 + .075$ in. = 4.42 in. as the height of the line BC for lat. $41^{\circ}30'$. If you have a table of natural functions, the height

of the line BC, or the style, is the base (5 in. in this case) times the tangent of the degree of latitude. Draw the line AD, and the angle BAD is the correct angle for the style for the given



Details of Dial

latitude. Its thickness, if of metal, may be conveniently from $\frac{1}{8}$ to $\frac{1}{4}$ in.; or if of stone, an inch or two, or more, according to the size of the dial. Usually for neatness of appearance the back of the style is hollowed as shown. The upper edges which cast the shadows must be sharp and straight, and for this size dial (10 in. in diameter) they should be about $7\frac{1}{2}$ in. long.

To lay out the hour circle, draw two parallel lines AB and CD, Fig. 2, which will represent the base in length and thickness. Draw two semi-circles, using the points A and C as centers, with a radius of 5 in. The points of intersection with the lines AB and CD will be the 12-o'clock marks. A line EF drawn through the points A and C, and perpendicular to the base or style, and intersecting the semi-circles, gives the 6-o'clock points. The point marked X is to be used as the center of the dial. The intermediate hour and half-hour lines can be plotted by using table No. 2 for given lati-

TABLE No. 1.
Height of stile in inches for a 5 in.
base, for various latitudes

Latitude	Height	Latitude	Height
25°	233	42°	450
26°	244	44°	483
27°	255	46°	518
28°	266	48°	555
30°	289	50°	596
32°	312	52°	640
34°	337	54°	688
36°	363	56°	741
38°	391	58°	800
40°	420	60°	866

tudes, placing them to the right or left of the 12-o'clock points. For latitudes not given, interpolate in the same manner as for the height of the style. The

the correct time for longitude 75° New York, 90° Chicago, 105° Denver and 120° for San Francisco. Ascertain in degrees of longitude how far your dial

is east or west of the nearest standard meridian and divide this by 15, reducing the answer to minutes and seconds, which will be the correction in minutes and seconds of time. If the dial is east of the meridian chosen, then the watch is slower; if west, it will be faster. This correction can be added to the values in table No. 3, making each value slower when it is east of the standard meridian

TABLE No.2.
Chords in inches for a 10in. circle Sundial.

Latitude	HOURS OF DAY											
	12-30	1	1-30	2	2-30	3	3-30	4	4-30	5	5-30	
11-30	11	10-30	10	9-30	9	8-30	8	7-30	7	6-30		
25°	.28	.56	.87	1 19	1.57	1.99	2.49	3.11	3.87	4.82	5.93	
30°	.33	.66	1.02	1 40	1.82	2.30	2.85	3.49	4.26	5.14	6.10	
35°	.38	.76	1.16	1.59	2.06	2.57	3.16	3.81	4.55	5.37	6.23	
40°	.42	.85	1.30	1.77	2.27	2.82	3.42	4.07	4.79	5.55	6.32	
45°	.46	.94	1.42	1.93	2.46	3.03	3.64	4.29	4.97	5.68	6.39	
50°	.50	1.01	1.53	2.06	2.68	3.21	3.82	4.46	5.12	5.79	6.46	
55°	.54	1.08	1.63	2.19	2.77	3.37	3.98	4.60	5.24	5.87	6.49	
60°	.57	1.14	1.71	2.30	2.89	3.49	4.10	4.72	5.34	5.93	6.52	

1/4-hour and the 5 and 10-minute divisions may be spaced with the eye or they may be computed.

When placing the dial in position, care must be taken to get it perfectly level and have the style at right angles to the dial face, with its sloping side pointing to the North Pole. An ordinary compass, after allowing for the declination, will enable one to set the dial, or it may be set by placing it as near north and south as one may judge and comparing with a watch set at standard time. The dial time and the watch time should agree after the watch has been corrected for the equation of time from table No. 3, and for the difference between standard and local time, changing the position of the dial until an agreement is reached. Sun time and standard time agree only four times a year, April 16, June 15, Sept. 2 and Dec. 25, and on these dates the dial needs no correction. The corrections for the various days of the month can be taken from Table 3. The + means that the clock is faster, and the — means that the dial is faster than the sun. Still another correction must be made which is constant for each given locality. Standard time is

and faster when it is west.

The style or gnomon with its base can be made in cement and set on a cement pedestal which has sufficient base placed in the ground to make it solid.

The design of the sundial is left to the ingenuity of the maker.—Contributed by J. E. Mitchell, Sioux City, Iowa.

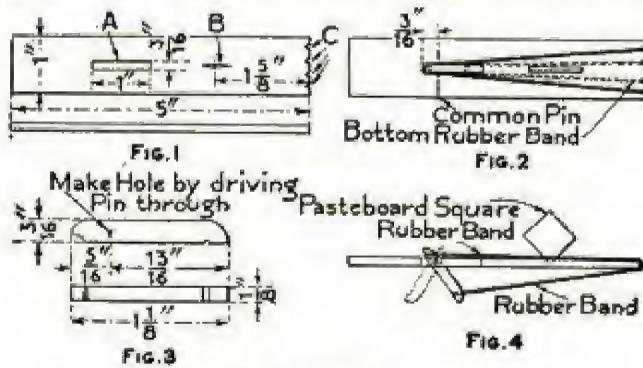
TABLE No.3
Corrections in minutes to change
Sun time to local mean time,—add
those marked +, subtract those
marked —, from Sundial time.

Day of month	1	10	20	30
January	+3	+7	+11	+13
February	+14	+14	+14	
March	+13	+11	+8	+5
April	+4	+2	-1	-3
May	-3	-4	-4	-3
June	-3	-1	+1	+3
July	+3	+5	+6	+6
August	+6	+5	+3	+1
September	+0	-3	-6	-10
October	-10	-13	-15	-16
November	-16	-16	-14	-11
December	-11	-7	-3	+2

Toy Gun for Throwing Cardboard Squares

The parts of the gun are attached to a thin piece of wood 1 in. wide and 5 in. long. It is best to use a piece of wood cut from the side or cover of a cigar box. A rectangular hole $\frac{3}{16}$ in. wide and 1 in. long is cut in the wood longitudinally along its axis and $1\frac{3}{8}$ in. from one end, as shown at A, Fig. 1. A small notch is made with the point of a knife blade at B and notches are cut in the end of the wood as shown at C. Rubber bands are fastened in these notches as shown in Fig. 2. The trigger, whose dimensions are given in Fig. 3, is fastened in the hole A, Fig. 1, by driving a pin through the wood. The assembled parts are shown in Fig. 4.

Place the cardboard square in the nick B, attach the rubber bands and pull the trigger. The top rubber band will fly off and drive the cardboard



Details of Toy Gun

square 75 ft. or more. The cardboard should be about $\frac{1}{2}$ in. square. These can be cut from any old pasteboard box.—Contributed by Elmer A. Vanderslice, Phoenixville, Pa.

Photographic Developing Tray

Plates developed in an ordinary tray must be removed from the bath occasionally for examination. The film when in a chemical-soaked condition is easily damaged. The tray illustrated herewith was made for the purpose of developing plates without having to take hold of them until the bath had completed its work, the examination being made through the plate and the bottom of the tray.

A pocket is provided for the liquid developer in one end of the tray when it



Fig. 1

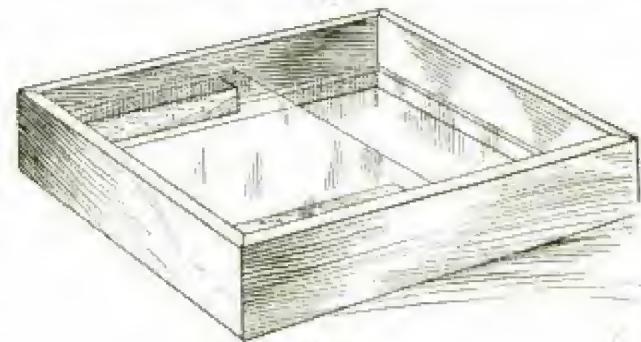


Fig. 2

Developing Tray with Glass Bottom

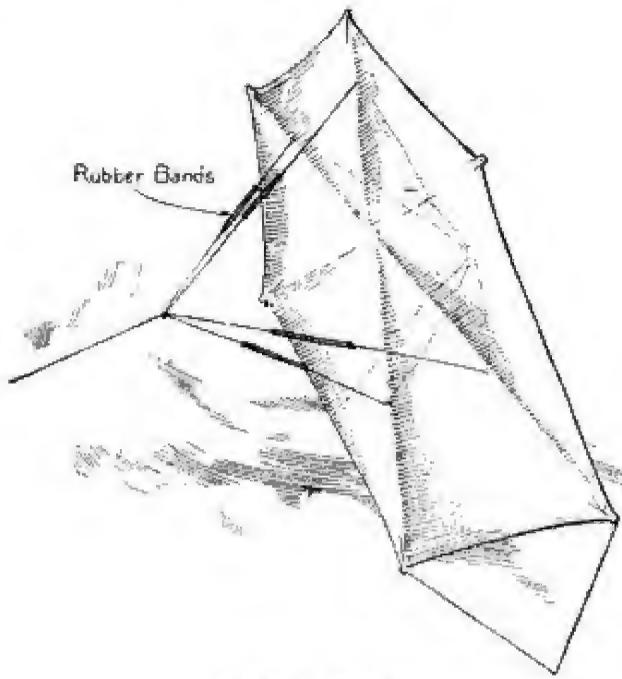
is turned up in a vertical position. A tray for developing 5 by 7-in. plates should be made 8 in. square inside. The side pieces with the grooves for the glass are shown in Fig. 1. Two of each of these pieces are made with mitered ends. The short groove shown in the top piece of the illustration is for inserting the plate covering on the pocket end of the tray.

Two blocks, one-half the length of the side pieces, are put in between the glass plates to hold the plate being developed from dropping down when the tray is tipped up in a vertical position. The glass bottom of the tray is $8\frac{1}{2}$ in. square, which allows $\frac{1}{4}$ in. on all edges to set in the grooves of the side pieces. The wood pieces should be well soaked in hot paraffin, and the mitered corners well glued and nailed.—Contributed by J. A. Simonis, Fostoria, Ohio.

CA good filler used as a putty on iron castings may be made as follows: Take, by weight, 3 parts of stiff keg lead, 5 parts of black filler, 2 parts of whiting, 5 parts of pulverized silica and make into a paste with a mixture of one part each of coach japan, rubbing varnish and turpentine.

Rubber Bands in Kite Balancing Strings

Kite flyers will find it to their advantage to place rubber bands of suit-



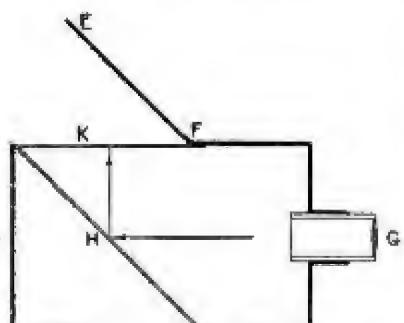
Bands in String

able size in the balancing strings to the kite, as shown in the illustration. This will prevent a "break-away" and also make the right pull, if only two bands are put in the lower strings.—Contributed by Thos. DeLoof, Grand Rapids, Michigan.

An Aid in Sketching

Sketching requires some little training, but with the apparatus here illustrated an inexperienced person can

obtain excellent results. The apparatus is made of a box 8 in. deep, 8 in. wide and about 1 ft. long. A double convex lens, G, is fitted in a brass tube which should have a sliding fit in another shorter and larger tube fastened to the end of the box. A mirror, H, is set at an angle of 45 deg.



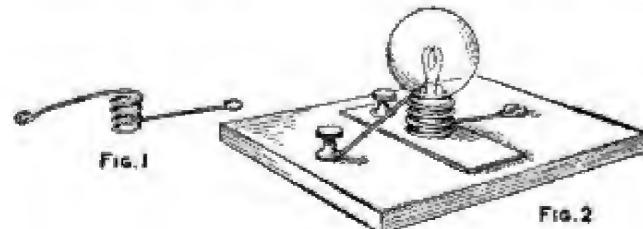
be attached to any smooth surface of wood without making a regular base.—Contributed by Abner B. Shaw, No. Dartmouth, Mass.

in the opposite end of the box. This reflects the rays of light passing through the lens to the surface K, which may be either of ground or plain glass. The lid or cover E F protects the glass and keeps the strong light out when sketching. The inside of the box and brass tube are painted a dull black.

In use, the device is set with the lens tube directed toward the scene to be painted or sketched and the lens focused so the reflected picture will be seen in sharp detail on the glass. Select your colors and put them on the respective colors depicted on the glass. If you wish to make a pencil drawing, all you have to do is to fill in the lines in the picture on the ground glass. If a plain glass is used, place tracing paper on its surface, and the picture can be drawn as described.

How to Make Miniature Electric Lamp Sockets

A socket for a miniature lamp can be made as shown in the sketch. A brass spring wire is wound around the base of the threads on the lamp and an eye turned on each end to receive a screw and a binding-post, as shown in Fig. 1. A piece of metal, preferably copper, is attached to a wood base as shown in Fig. 2 and the coil-spring socket fastened across it in the opposite direction. Bend the wire so that the spring presses the lamp against the metal. If the wire fits the lamp loosely, remove the lamp and press the sides of the coil closer together. The metal parts can



Wire Socket

be attached to any smooth surface of wood without making a regular base.—Contributed by Abner B. Shaw, No. Dartmouth, Mass.

Wood-Working for Beginners

Making a Taboret—Typical Form for the Method of Laying Out and Working a Dado—Vertical and Horizontal Paring

By IRA S. GRIFFITH

CHAPTER XII

Referring to the working drawing, Fig. 69, make out a stock bill of material needed. If possible, use chestnut for this piece. It is easily worked, being soft wood, and takes a fine finish, owing to its open grain.

The top and shelf are octagonal. To make them, square up the two pieces to size in the usual manner. After this has been done so that the two pieces are of the same size as well as square, draw the diagonals, the lines of which extend from corner to corner across the board—or at least draw enough so that they shall cross and indicate the center of the boards. With the rule measure accurately from each of the four corners each way, along the edge and end, a distance equal to one-half a diagonal. Connect these points as shown in the top view of the working drawing. The eight sides should be of the same length. Saw off the corners and plane to the lines.

Square up the four legs to width, and if rough stock, to thickness. Since the top end is to be rounded, it is necessary to square only one end of each piece. Before rounding the tops or shaping the sides of the legs, it is advisable to lay off and cut the dadoes, the grooves into which the shelves are to be fitted. To lay these out, place all four pieces on the bench side by side, face edges up, squared ends evened, and measure and mark with a knife point the locations of the sides of the dadoes. Separate the pieces, after having squared knife lines across the edges, and carry these knife lines across each of the face sides. Carry these lines across the second edges also. Set the gauge for the required depth and gauge between the knife lines on the two edges.

Before cutting the dadoes, it is well to be sure that none of them will be

too wide. To do this, place the legs in the positions they are to occupy relative to one another in the finished piece, then mark with corresponding

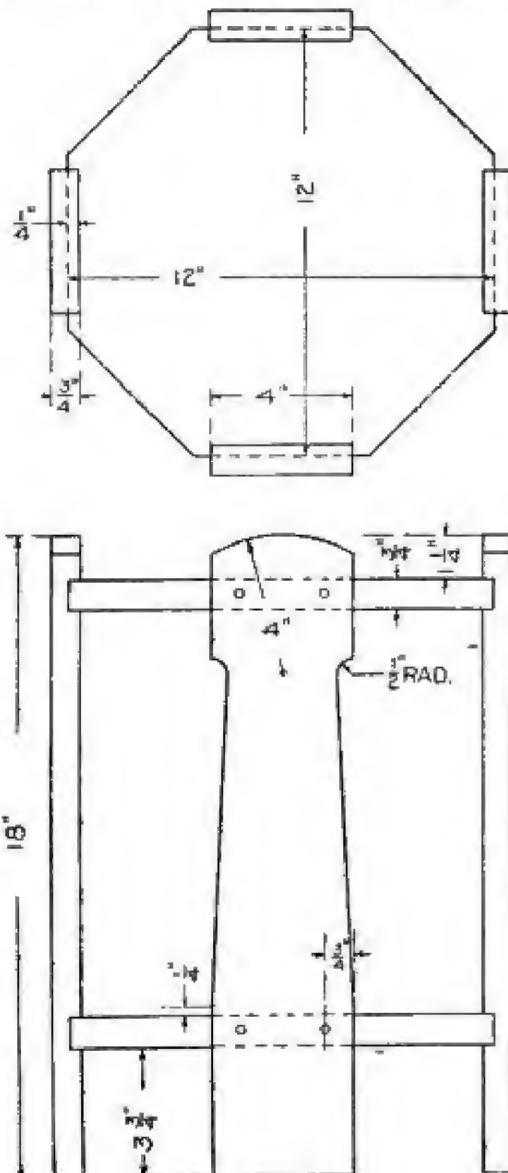


Fig. 69—Details of Taboret

figures or letters the edges of the shelves and the dadoes into which they are to fit. Test each dado by superimposing its shelf edge upon it. If the surface planing of the shelves was carefully done, all joints ought to answer the test. Should there be any variation, care should be taken to move only the lines representing the lower edges of the dado. In marking the corresponding members of a joint,

Roman numerals should be cut with a chisel in the edge of the shelf deep enough to be visible even after the

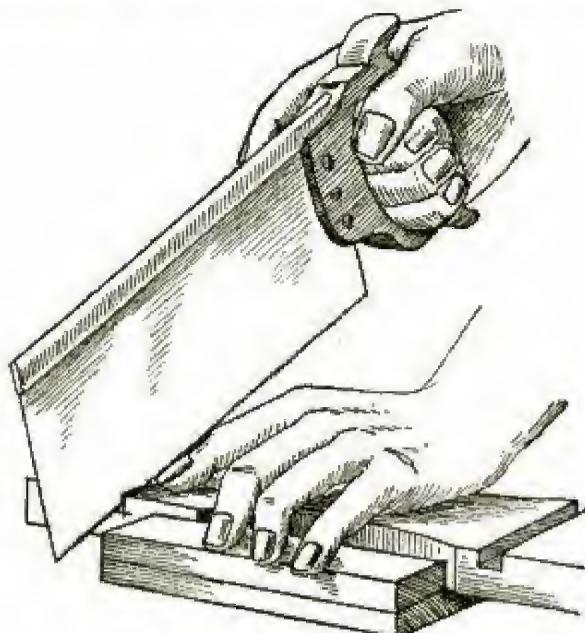


Fig. 70—Sawing Dado



Fig. 71—Chisel

stain and filler have been applied. The dado should be marked lightly with pencil until the groove is cut, after which the Roman numeral should be chiseled in the bottom of the dado. The finish of stain and filler should be applied before the members are assembled. Time is saved and a better finish obtained by this method of procedure.

The best way for the beginner to work the dado is as follows: Take a tenon saw, Fig. 70, and saw about $1/16$ in. inside and parallel to the lines that represent the sides of the dadoes. In using this saw, the cut may be begun on the arris near to or away from the worker. If it is begun on the near arris, the handle should be held lower than the point where the cutting is to begin and be raised gradually as the teeth progress across the surface of the board. If the cut is begun on the far side, the handle should be held high in starting and be lowered gradually as the cutting proceeds. The saw

blade should have the constant guidance of either the thumb or forefinger of the left hand. The strokes should be short and easy at first. As the sawing proceeds gradually increase the number of teeth used, but continue the slow regular strokes. Saw only to the gauge lines, watching both edges while nearing the lines.

Having sawed the sides of all the dadoes, the next step is to chisel to depth. Figure 71 shows the chisel used for paring. Fasten the work so as to leave both hands free to hold the chisel. Both hands should at all times be kept back of the cutting edge or serious accidents may occur. "Rough out" the waste material in the dado, cutting as much material at each stroke as may be removed by tapping the end of the chisel with the palm of the hand. On hard wood a mallet should be used. Incline the cutting edge of the chisel upward to allow for slanting grain in the wood, Fig. 72-A. Rough out a little over half way across the dado, holding the bevel side of the chisel up. Next, hold the chisel as in

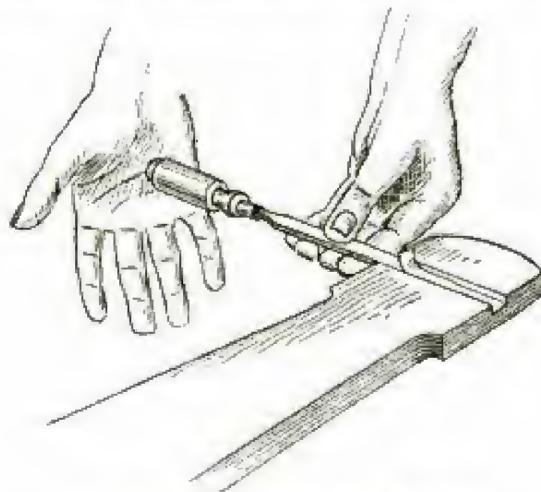


Fig. 72A—Removing Waste Material

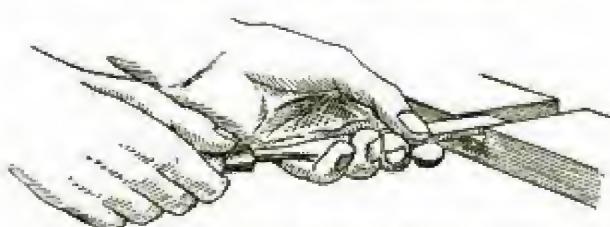


Fig. 72B—Finishing with a Paring Cut

Fig. 72-B, move the handle laterally, at the same time forcing the edge into the wood. This lateral movement is

to give a shearing cut. Pare off very thin shavings while nearing the gauge line at the bottom of the dado and on the final cut place the cutting edge exactly in the gauge line. Finish the second side by cutting in a similar manner. A block into which has been driven a nail to the proper depth will indicate whether the proper depth has been obtained or not, Fig. 73.

The next step is to pare the sides of the dadoes. Hold the chisel as in Fig. 74, the left hand resting on the

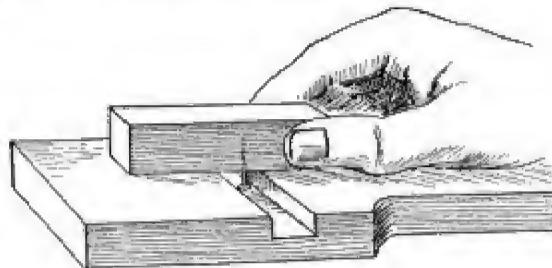


Fig. 73—Testing for Depth

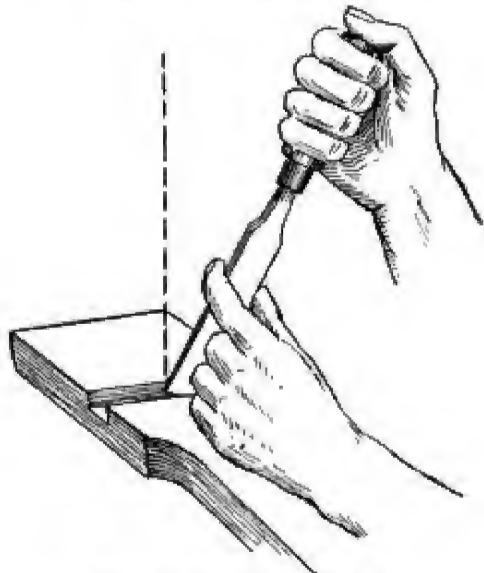


Fig. 74—Paring the Sides

wood to hold it down and the fingers helping to guide the chisel edge. Only a very small part of the cutting edge of the chisel is used, the hardness of the wood and the strength of the worker determining how much. The chisel handle is inclined toward the worker at the start and is gradually worked forward vertically as the pressure is applied. It is very important that the worker stand so as to look along the line he is cutting, otherwise he cannot sight the chisel plumb. The sides of the dado will therefore not be perpendicular. The larger

part of the blade, which is not used for cutting, is to be held against the perpendicular side of the dado already cut so as to aid in guiding the chisel.

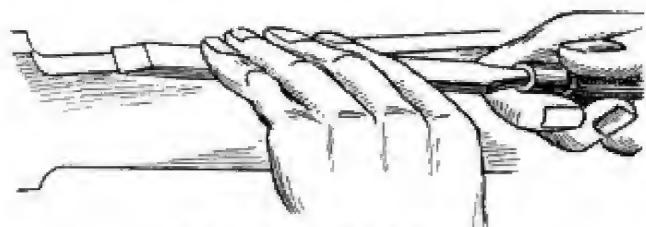


Fig. 75—Paring the Edges

The sides of the legs and the top ends should now be worked to shape. Place the four legs on the bench, side by side, and even the squared ends by means of the try-square. Measure from the squared end of one of them 14 in. and at this point square a light pencil line across the edges of all. Separate the pieces and carry this line across the faces of each piece, using try-square and sharp pencil. This line gives the location of the points from which the arcs are drawn for curved top and sides. The drawing shows the radii. An easy way to make the curves at the side of the leg is to place two pieces together edge to edge in the vise and bore a 1-in. hole, thus making an arc of $\frac{1}{2}$ -in. radius on each piece. Rip parallel to the straight lines and close to them and pare the edges as in Fig. 75. The top curves may be finished by sawing parallel to the line with the turning saw, Fig. 76, and finished with a spoke-shave, Fig. 77. Either of these tools

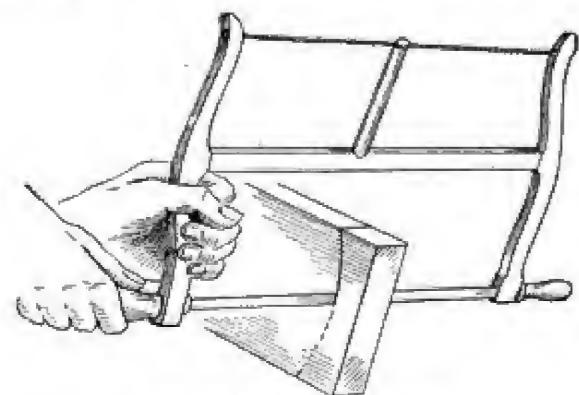


Fig. 76—Sawing the Curve

may be pushed or pulled, whichever is most convenient. On a curve crossing the grain as does this, carpenters

frequently use a plane instead of the spokeshave.

The parts of the taboret may be fastened together by means of round-

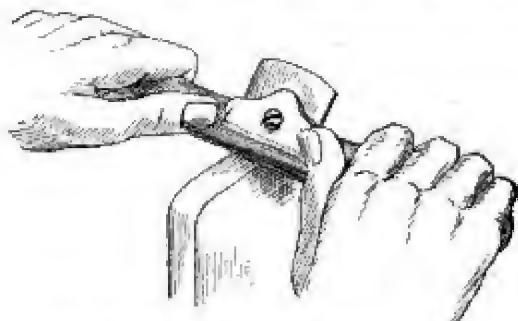


Fig. 77—Finishing with Spokeshave

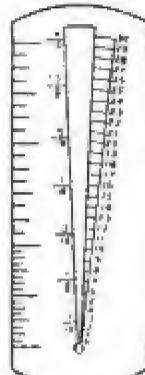


Fig. 78



Fig. 79—Countersunk Hole and a Countersink

headed screws. It will be necessary to locate by accurate measurement the places on the legs where holes are to be bored. Holes, somewhat smaller, just large enough to receive the core of the screw, will need to be bored in the shelf edges. Their locations are



Screwdriver Bit



Screwdriver



Gimlet Bit

Fig. 80

to be determined by superimposing the legs and marking through the holes

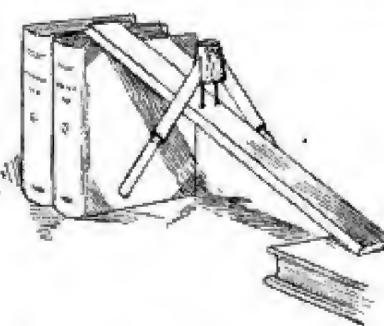
already made in the legs. Screws, like nails, are designated by the number of wire gauge from which they are made and the length in inches. Figure 78 shows a wire gauge for screws. It must not be confused with the wire gauge for nails. The gauge is slipped over the screw just below the head. Flat-headed screws must have the holes countersunk. A countersunk hole and a countersink for making it are shown in Fig. 79. With a dark finish use blued screws; with a light finish use brass screws. The screwdriver bit will be found helpful in putting in these screws (Fig. 80). The gimlet bit (Fig. 80) will be needed for boring the smaller holes.

While it may be advisable to leave the surface planing of the legs until the last thing before sandpapering, staining and filling, it is absolutely necessary to have the surfaces of the shelves smoothed of their mill-marks before the dadoes are cut and fitted.

(To be Continued.)

The Walking Cork

This is a simple device which is not a trick, but its effect is rather comical. Procure an ordinary cork and stick two pins into one end. Then two knives of equal weight must be stuck into opposite sides of the cork as shown in the sketch.



A flat rule is arranged as a sloping platform with a fairly high support at one end and a slightly lower support at the other. Two piles of books will serve for these supports quite well.

The cork is set up on its pins on the rule and then started on its journey with a slight rocking movement. It will now proceed to walk the whole length of the rule, first on one pin and then on the other.

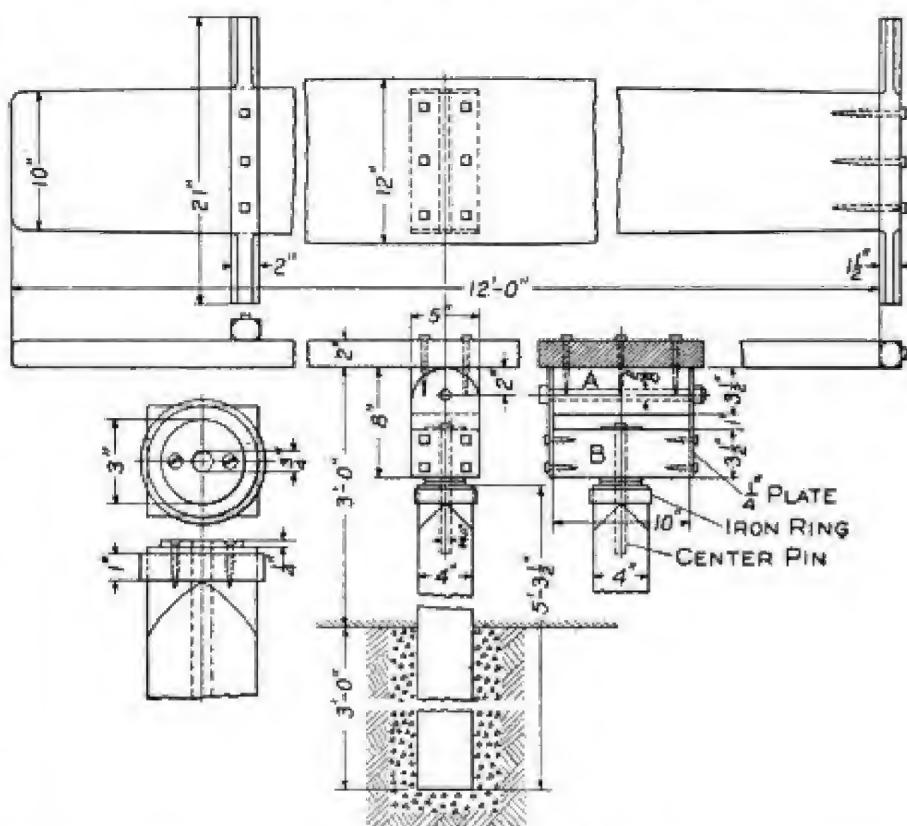
A Revolving Teeter Board

The accompanying sketch shows the details of a revolving teeter board for the children's playground that can be constructed in a few hours. Secure a post, not less than 4 in. square and of the length given in the drawing, and round the corners of one end for a ring. This ring can be made of 1-in. strap iron and it should be shrunk on the post. Bore a $\frac{3}{4}$ -in. hole in the end of the post for the center pin to rest in. Make three washers 3 in. in diameter and $\frac{1}{4}$ in. thick and drill $\frac{3}{4}$ -in. holes through their centers. Drill and countersink two smaller holes for 2-in. wood screws in each washer. Fasten one of these washers to the top of the post as shown. The post is now ready to be set in the ground. Coarse gravel should be packed tightly about it to make it solid. Concrete is much better if it can be secured.

To make the swivel you will need two $\frac{1}{4}$ by 5 by 8-in. plates, rounded at the top as shown, and two wood blocks, A and B, each $3\frac{1}{2}$ by 5 by 10 in. Drill the lower ends of the plates for four $2\frac{1}{2}$ -in. lag screws and the upper ends for a $\frac{5}{8}$ -in. bolt. Fasten the plates to the block B, then drill a $\frac{3}{4}$ -in. hole as shown and fasten the two remaining washers to the block, one on each side and central with the hole. Bore a $\frac{5}{8}$ -in. hole lengthwise through the block A for the $\frac{5}{8}$ -in. rocker bolt. This bolt should be $11\frac{1}{2}$ in. long.

The teeter board is made of a 2 by 12-in. plank about 12 ft. long. It should be slightly tapered from the center to the ends. Two styles of hand holds are shown, but the one on the left is the one most generally used. The handles are rounded at the ends and

are fastened to the board with lag screws or bolts. The block A is fastened to the board with lag screws and should be a working fit between the

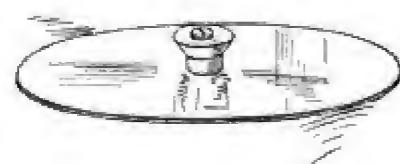


Details of Teeter Board

two plates where it is held by means of the $\frac{5}{8}$ -in. bolt. The center pin is $\frac{3}{4}$ in. in diameter and about 9 in. long.—Contributed by W. H. Dreier, Jr., Camden, N. J.

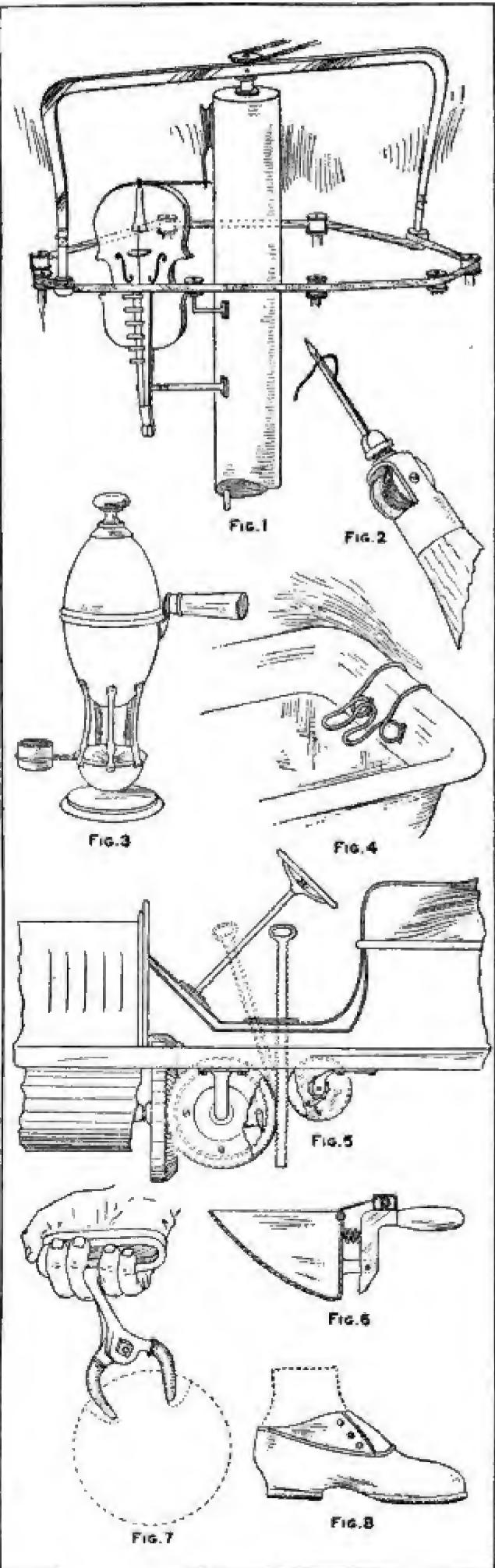
Home-Made Pot Covers

Empty thread spools and the tins used as extra inside covers in lard cans are usually thrown away, but these can be put to good use as kettle covers, if they are made up as follows:



Saw the spool in half as shown, make a hole in the center of the tin and run a screw or nail through the spool and the tin; then flatten its end on the under side. This will make an excellent cover for a pot.—Contributed by Maurice Baudier, New Orleans, La.

INTERESTING PATENTS.



BOW FOR SELF-PLAYING VIOLINS—A revolving bow for the mechanical playing of a violin is shown in Fig. 1. The support holding the revolving band is mounted on the standard to which the violin is attached, and is revolved by means of a chain drive.

* * *

LOCK-STITCH SEWING AWL—Figure 2 illustrates an awl especially designed for the use of farmers in the repairing of shoes, harness, belts, carpets, rugs, etc. The reel carrying the thread is just back of the needle head. The operation is simple. After the thread has been forced through the leather, the reel is released and the thread drawn out to twice the length required for the stitch. The needle is then withdrawn, the end of the thread being held firmly in the left hand, only enough being drawn back to allow the starting of a new stitch. The needle is forced through again at the desired distance, allowing the reel to turn, then, with finger firmly pressed against the reel, is drawn part way back, forming a loop through which the end of the thread is passed. The stitch is completed by pulling it well into the leather, the reel being prevented from turning by placing the finger against it.

* * *

INDIVIDUAL EGG BOILER—The ingenious egg boiler shown in Fig. 3 is a French invention, consisting of an egg-shaped receptacle into which an egg and a small quantity of water are placed. The water is measured by the little cup shown in the holder extending from the base of the boiler. A sponge, dipped in alcohol, and placed in the cup under the egg container, furnishes the heat. The quantities of water and alcohol are so proportioned that when the alcohol is consumed and the flame goes out, all the water is vaporized and a medium-boiled egg results.

* * *

HEAD-REST FOR BATHTUBS—Figure 4 is a head-support which hooks over the rim at the back of a bathtub. The device is made of one piece of wire, having its ends bent into supporting hooks and its intermediate portion shaped to form a series of loops for supporting the head. A wash cloth may be placed over the loops to make the rest more comfortable.

* * *

AUTOMOBILE ENGINE STARTER—A method of starting an automobile engine without having to leave the driving seat is shown in Fig. 5. Between a rotatory member in operative connection with a power shaft and a second rotatory member mounted adjacent, is a toothed starting bar, the drawing upward of which causes the first mentioned rotatory member to turn the shaft, thus starting the engine.

* * *

WEIGHING SCOOP—Figure 6 is a scoop designed to weigh the material it handles. The operation is clearly shown in the illustration, the scoop proper being attached to the handle by means of a spiral spring and a pivoted connection. A measuring tape extends from a spring reel on the top of the handle to the top of the inner wall of the scoop. The extent to which this measuring tape is drawn out by the movement of the scoop under its load is supposed to show the exact weight of the load, the measuring tape being marked off in ounces and pounds.

* * *

BOWLING-BALL GRIP—Figure 7 is a bowling-ball grip, somewhat similar to ice tongs in operation, by which bowlers may launch the heavy balls down a bowling alley. Releasing the pressure of the fingers against the smaller of the loops allows the ball to slip free.

PRACTICAL OR UNIQUE

RUBBERS PROVIDED WITH HALF TOPS—A rubber designed to protect the lower half of a shoe top in front is shown in Fig. 8. The appearance of this rubber is sufficiently similar to the buttoned oxford rubber."

* * *

POWER-OPERATED HANDSAW—Figure 9 is a power-driven handsaw. The eccentrically mounted driving mechanism is located in the body portion between the parallel guideways which are provided to carry the extensions of the saw frame.

* * *

TELEGRAPH-SENDING APPARATUS—This curious apparatus (Fig. 10) is designed to simplify the action of sending in telegraphy. It is attached by pivotal supporting screws to an ordinary telegraph key, and sends dots by a single movement in one direction, and dashes by a single movement in the other direction.

* * *

"SAFE" FIRE ESCAPE—Figure 11 is an Ohio inventor's idea of an effective fire escape, and comprises an inclined track and a carriage resembling a safe. The track, which is nothing more or less than a specially constructed ladder, is raised against the wall under the window from which the occupants of a burning building are attempting to escape. The carriage, which is constructed to withstand the flames that might engulf it while passing a lower window, is then hauled to the top of the ladder or track by means of the tackle provided, and the escaping persons enter by climbing into it through the back.

* * *

INGENIOUS TOOL CARRIER AND CHEST—A novel method of nesting and carrying carpenters' tools is shown in Fig. 12. It consists of a miter box, a tool chest, and a multi-part tool-holding device, the parts of the latter being pivotally connected with the miter box and chest. The bit stock is utilized as a handle for carrying the whole.

* * *

BICYCLE BOAT—Figure 13 is a bicycle boat, consisting of a vessel of the row-boat type provided with a pedal-driven propeller. Part of a bicycle frame, with saddle, is mounted in the center of the boat. The bicycle handle is utilized to turn a rudder, located directly underneath.

* * *

PISTOL PADLOCK—A novelty in locking devices is the pistol padlock shown in Fig. 14. The action of pulling the trigger releases the spring and throws the hasp back.

* * *

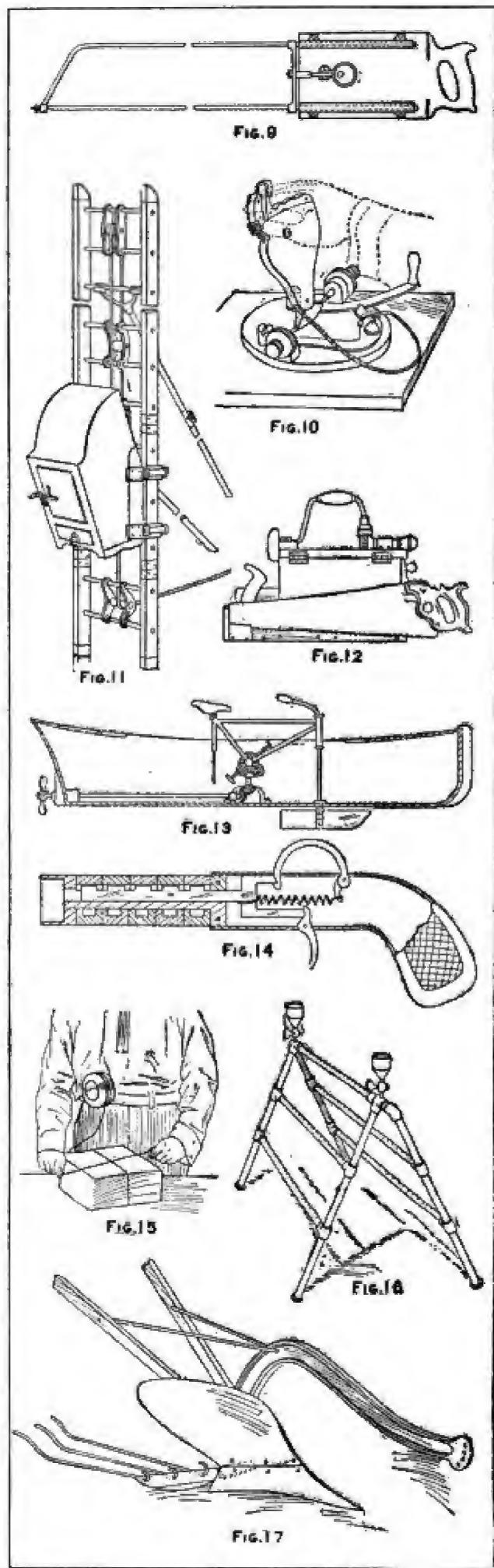
INDIVIDUAL TWINE HOLDER—Figure 15 is a small twine holder adapted to attachment to the belt or waist of the user. The casing contains a reel, which is easily removed, when run bare, for the insertion of a loaded reel. The holder is made of aluminum.

* * *

MEDICATED POULTRY ROOST—The tubular legs and cross-bars of this poultry roost (Fig. 16) are filled with wicking, which absorbs the insect-destroying fluid fed to it from the tanks. The legs and cross-bars are provided with perforations for the escape of the fluid.

* * *

PLOW ATTACHMENT—Figure 17 is an attachment for plows which crumbles the soil after it has been turned over. The extra blade with its trailing rods is secured to the bottom of the mold board of the plow.



THE ship was sinking. A great panic was imminent. "What shall we do?" cried the terrified passengers.

"Send for the barber," remarked the professional humorist. "He's the only man on board who can razor."

With justifiable rage they hurled him into the angry sea.—Philadelphia Record.

* * *

Percival (politely): Chicken croquette, please.

The Waiter (lustily): Fowl ball!

* * *

In a small western town there was an operator that stuttered, and a new subscriber called up one day and said:

"C-e-c-Cent-t-t-ral, wh-wh-wh-what t-t-t-time i-i-is it?"

Central answered him back like this:

"I-i-it i-i-is i-i-five th-th-thirty."

The subscriber said, "J-i-just i-f-or th-th-that, I am going to h-h-have my ph-ph-phone t-t-t-taken out."

* * *

"Speaking of farms," a Dakotan said, the other day, "we have some right sizable farms out in Dakota. Yes, sir, I've seen a man on one of our big farms start out in the spring and plow a straight furrow till fall. Then he turned around and harvested back."

"Wonderful," said I.

"On our Dakota farms," he went on, "it's the usual thing to send young married couples out to milk the cows. Their children bring back the milk."

"Wonderful," I replied.

"Once," he said, "I saw a Dakota farmer's family prostrated with grief. The women were weeping, the dogs were barking, the children were squalling, and the tears ran down the farmer's cheeks as he hitched up his twenty-mule team and drove off."

"Where was he going?" I asked.

"He was going half-way across the farm to feed the pigs," said the Dakotan.

"Did he ever get back?" I asked.

"It isn't time for him yet."

* * *

The Teacher—"Willie, can you tell what steam is?"

Willie—"Sure—it's water gone crazy with the heat."—News.

"Did you see the janitor?" asked Mrs. Shivvers.

"Yes," replied her husband. "I told him that it was as cold in our flat as at the north pole."

"What did he say?"

"He merely looked supercilious and asked for my proofs."—Washington Star.

* * *

New Reporter—The auto turned terrapin, and—
City Editor—You mean turned turtle.

New Reporter—Well, it was a high priced machine.—Judge.

* * *

A newly made magistrate was gravely absorbed in a formidable document. Raising his keen eyes, he said to the man who stood patiently awaiting the award of justice:

"Officer, what is this man charged with?"

"Bigotry, your worship. He's got three wives."

The new J. P. rested his elbows on the desk and placed his finger tips together. "Officer," he said, somewhat sternly, "what is the use of all this education, all these evening schools, all the technical classes, and what not? Please remember, in any future like case, that a man who has married three wives has not committed bigotry, but trigonometry. Proceed."—St. Paul Dispatch.

* * *

Captain Thomas S. Baldwin, who landed the other day with Clifford B. Harmon in the balloon "New York" in an out-of-the-way corner of Ohio, has a dry wit. He is as fond of exercising it as he is flying around Hempstead plains in his Red Devil.

"Oh, Captain Baldwin," said a dear old lady recently, pointing to the propeller of the gallant captain's aeroplane, "what's that flapper for?"

"That flapper, madam," gravely replied the captain, "is to scare the birds away when I am flying."—Cleveland Leader.

* * *

"The edge on a razor," said the garrulous barber, "improves by laying it aside for a time." "That being the case," rejoined the victim in the chair, "I'd advise you to lay aside the one you are using for about 2,000 years."

NEW BOOKS

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ELECTRICIANS' OPERATING AND TESTING MANUAL—By Henry C. Horstmann and Victor H. Tousley. A handbook for men in charge of electrical apparatus, repair men, trouble men, lamp trimmers and electricians generally. 359 pages, illustrated, flexible leather, \$1.50. Frederick J. Drake Co., Chicago.

COMPOSITION AND HEAT TREATMENT OF STEEL—By E. F. Lake. A practical book, and especially valuable at this time, to users as well as makers of steel, by reason of recent developments in this most important industry. 246 pages, 6x9. Illustrated, \$2.50. McGraw-Hill Book Company, New York.

THE YOUNG ELECTRICIAN—By Hammond Hall. Intended to "afford instructive amusement to intelligent boys," this book admirably fulfills its purpose. 289 pages, 12mo, cloth, \$1.50. Illustrated. The Macmillan Company, New York.

WELDING: THEORY, PRACTICE, APPARATUS AND TESTS—By Richard N. Hart, B. S. This is the first attempt to present under one cover all the available data on a most important subject. Beginning with the subject of metals generally, the book takes up in their order electric, hot-flame and thermal welding, including new brazing methods and solders, and giving due consideration to the working properties of all the commercial metals. 181 pages, 6x9, cloth, \$2.50. Illustrated. McGraw-Hill Book Company, New York.

THE SHEET JOBBING AND PLATE ROLLER'S ASSISTANT—By C. H. Kaufman. 363 pages, 5½x8½, cloth, \$5.00. In this, the third edition, the tables are based on 40 instead of 40.80 lb. per square foot of one inch thick. The West Virginia Printing Company, Wheeling, W. Va.

MECHANICAL DRAWING FOR PLUMBERS—By R. M. Starbuck. 111 pages, 6x9, illustrated, cloth, \$1.50. A re-publication in book form of Mr. Starbuck's series of articles on this subject in the Plumbers' Trade Journal. The Norman W. Henley Publishing Company, New York.

A TEXT-BOOK OF ELEMENTARY FOUNDRY PRACTICE—By William Allyn Richards, B. S. 121 pages, 6x8½, illustrated, cloth, \$1.50. This book is intended for the use of students in colleges and secondary schools, but the principles of the molder's craft are so plainly stated that it may safely be recommended also for those who hope to master them without the aid of an instructor. The Macmillan Company, New York.

STANDARD PRACTICAL PLUMBING—By R. M. Starbuck. 406 pages, 6x9, illustrated, cloth, \$3.00. The thirty chapters and the alphabetical index of this volume constitute a handy reference on all subjects connected with the plumber's craft—drainage and venting, ventilation, hot and cold water supply and circulation, etc. It has been prepared, evidently, by a practical man for practical use. The Norman W. Henley Publishing Company, New York.

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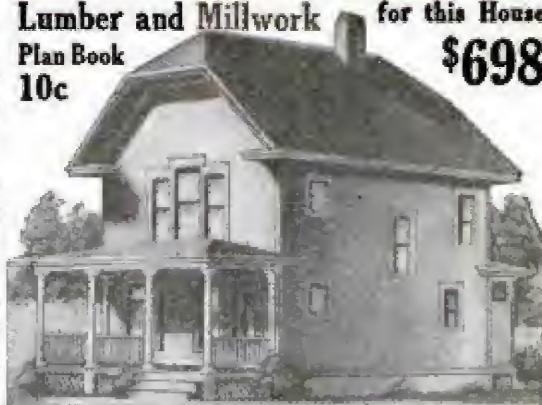


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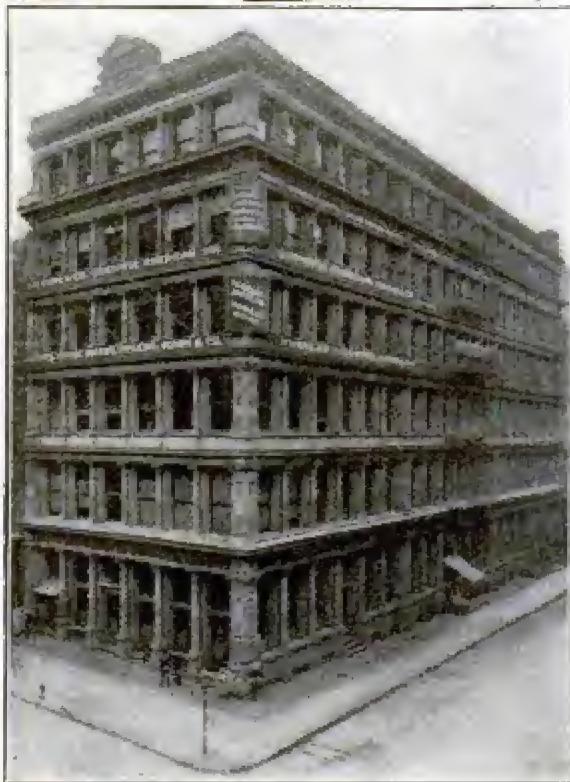
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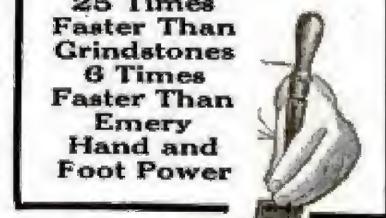
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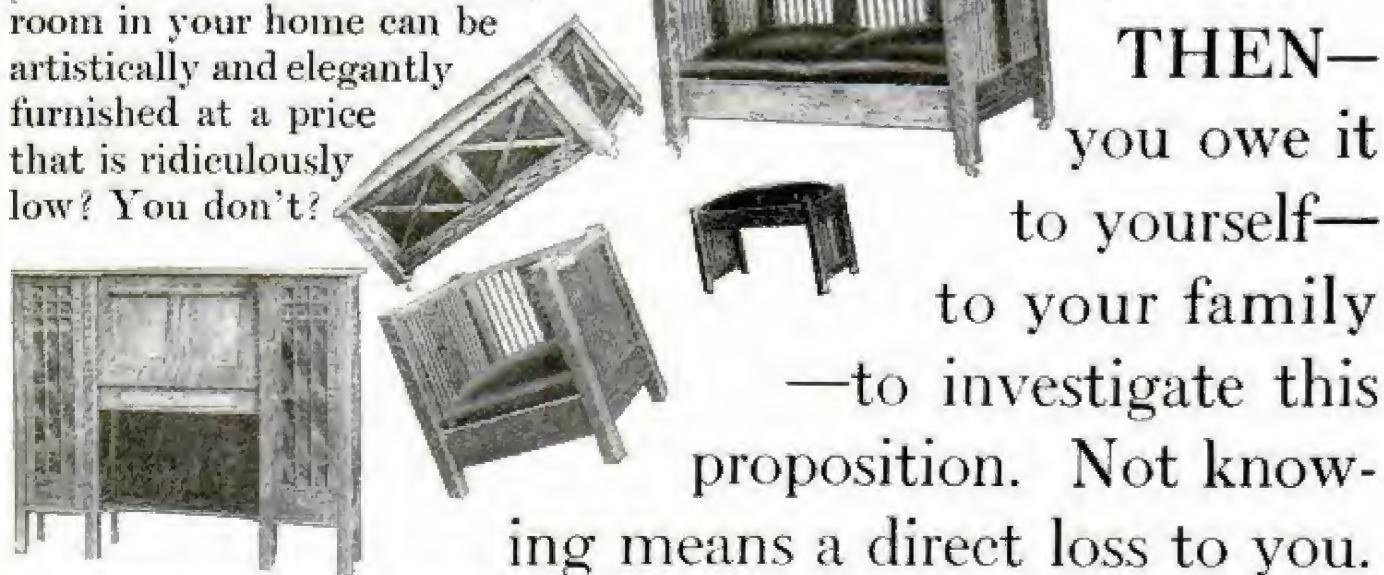


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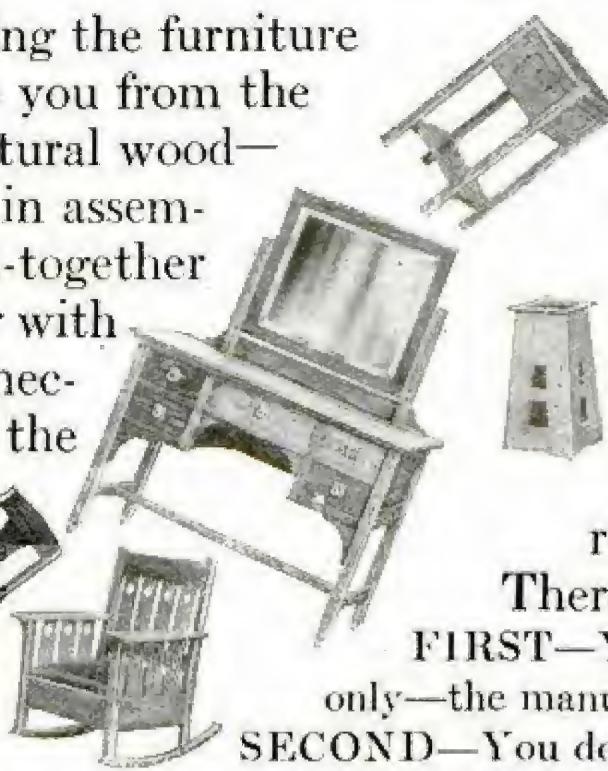
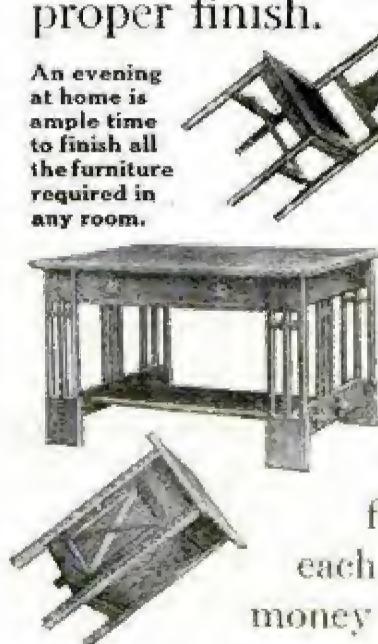
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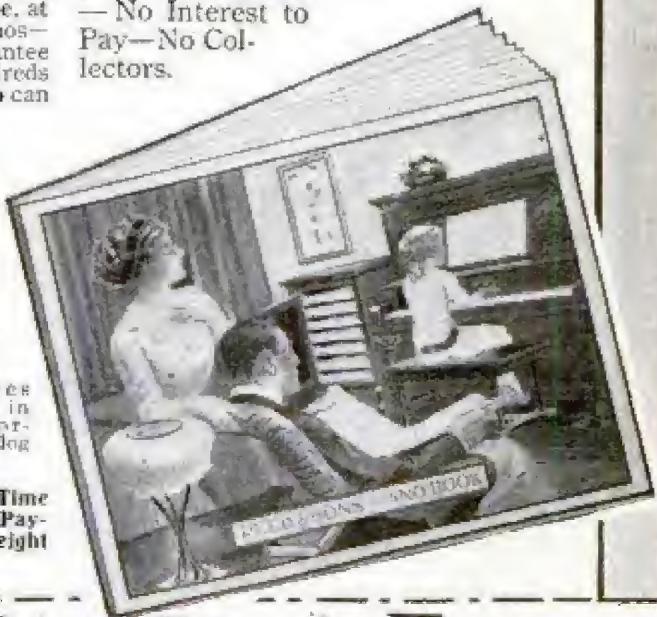
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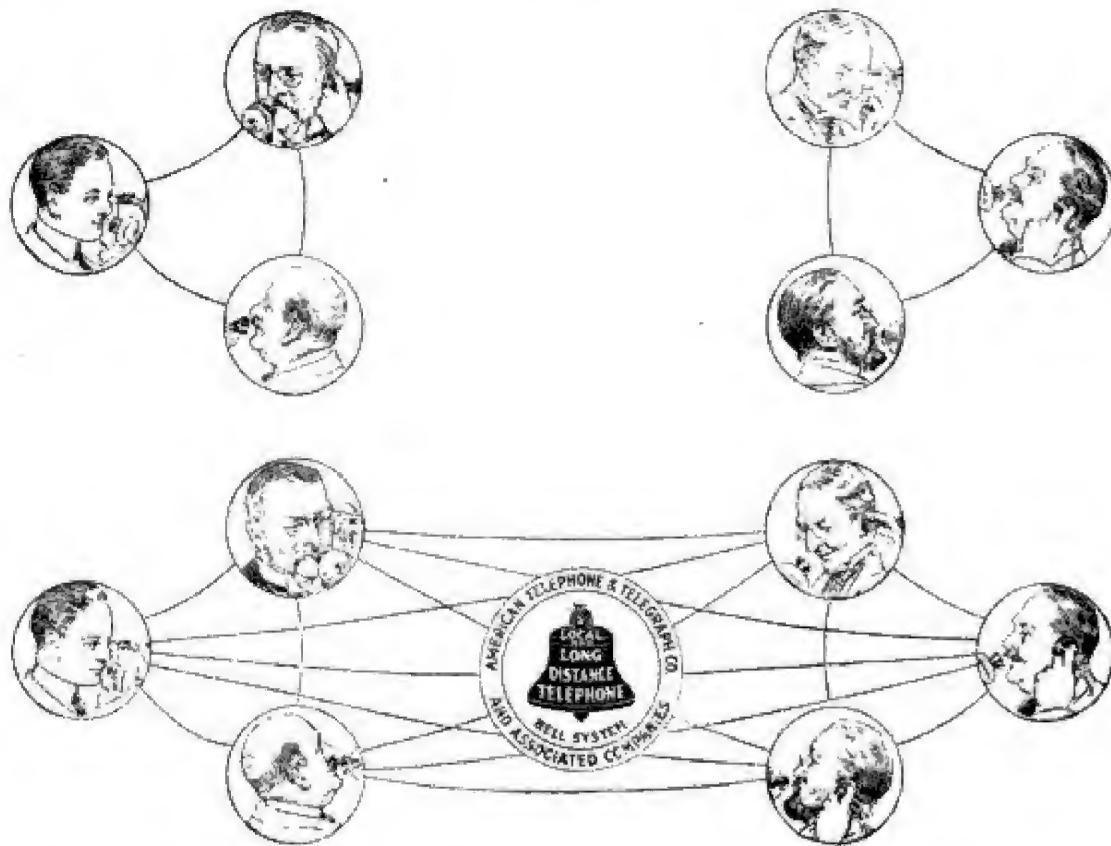
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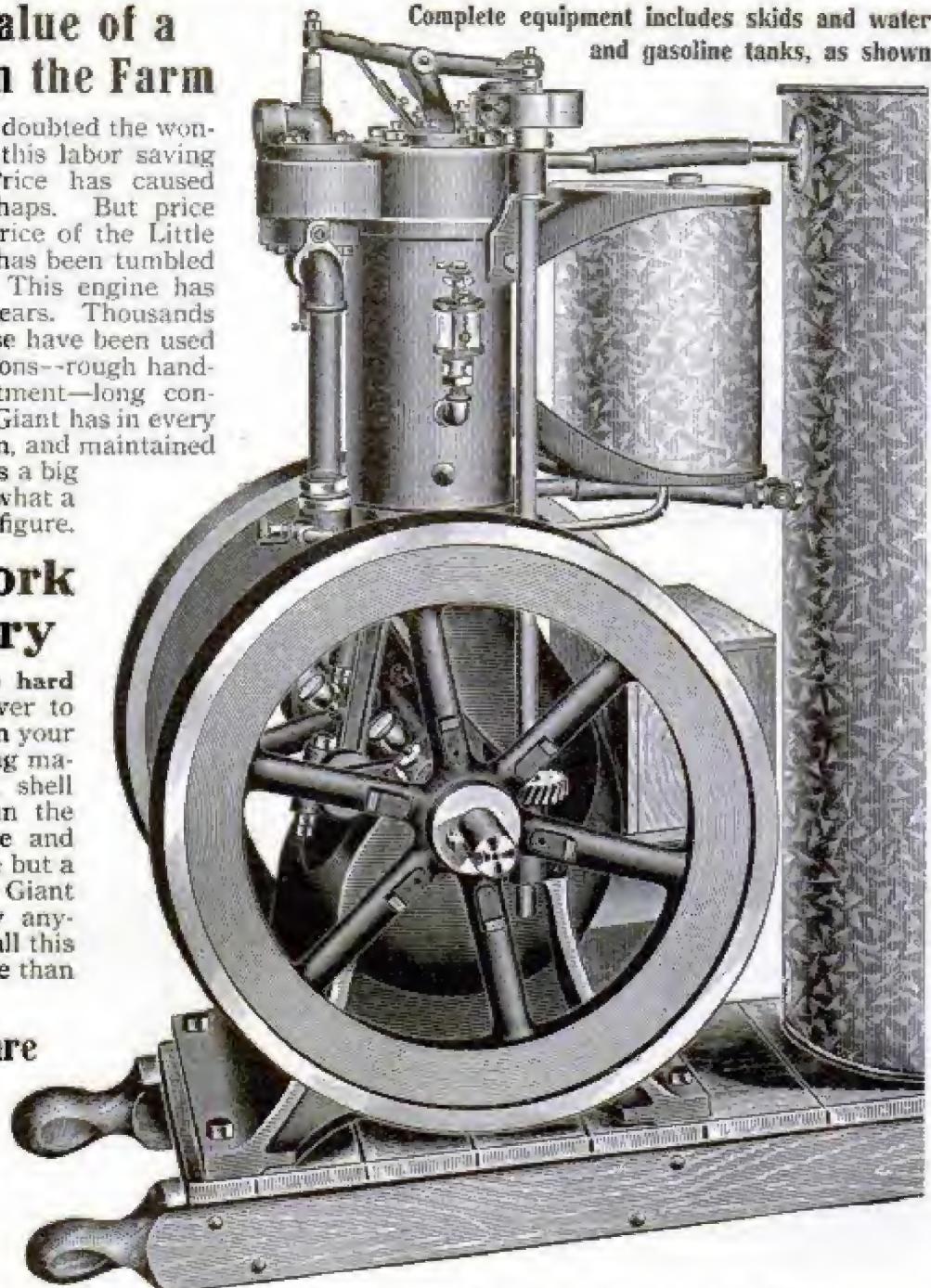
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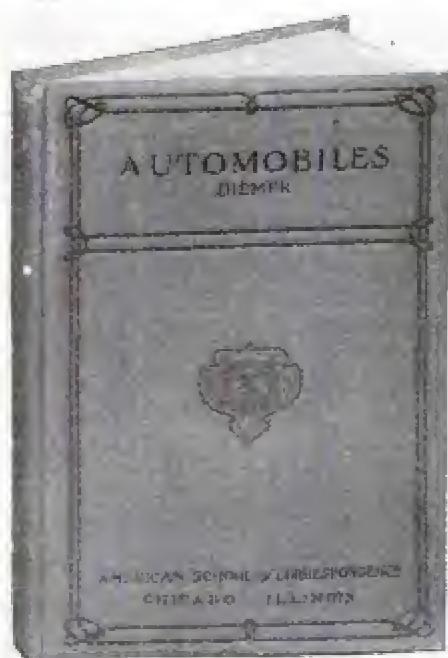


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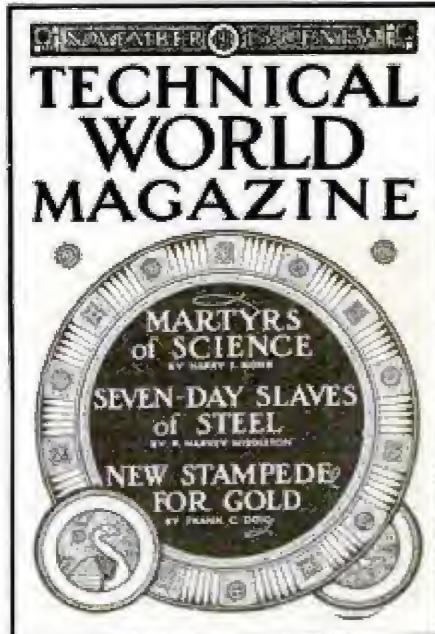
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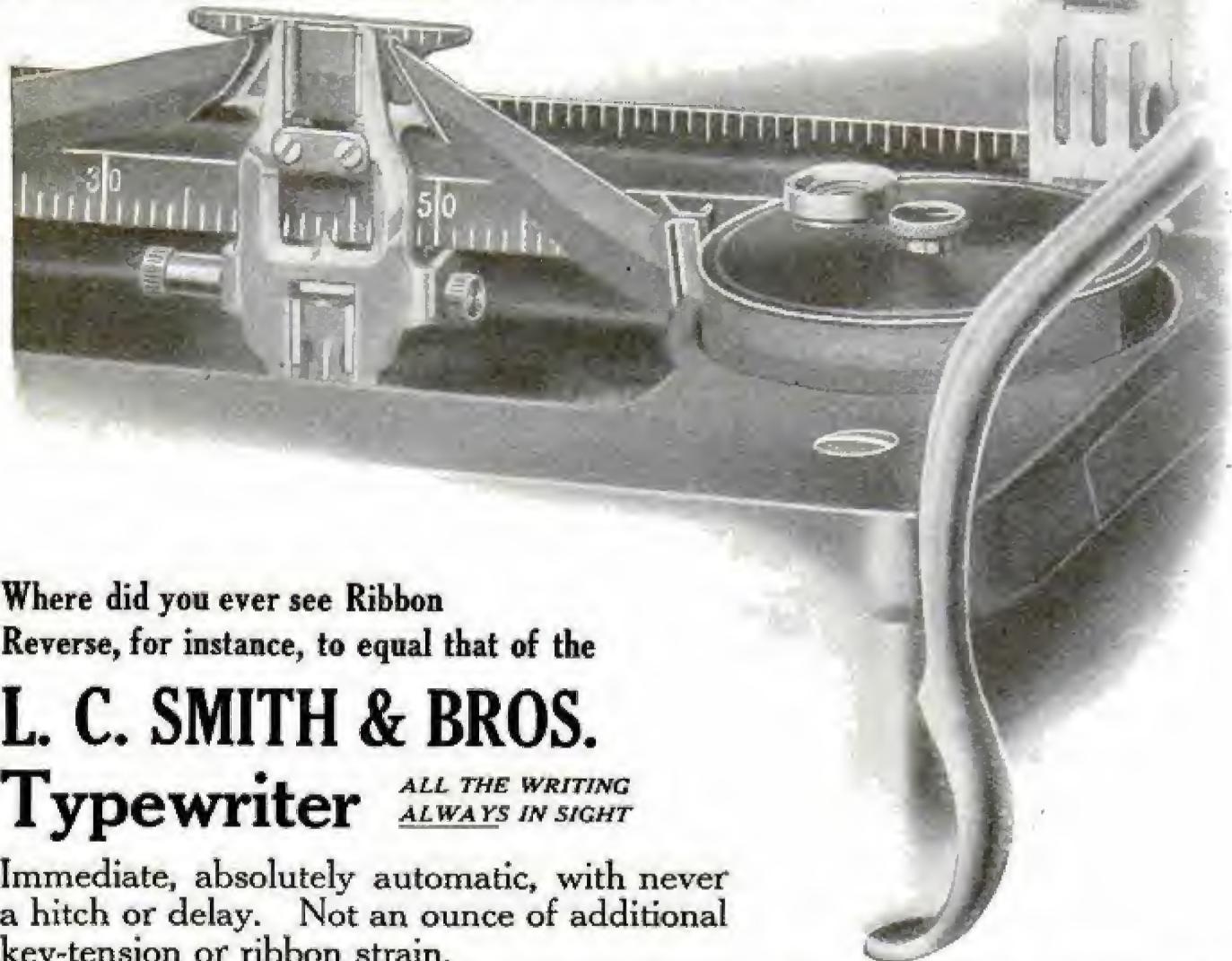
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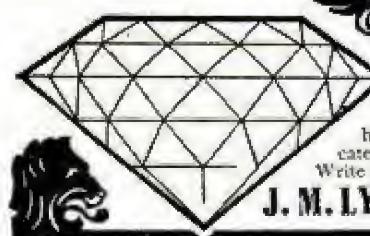
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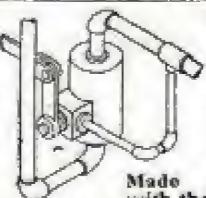
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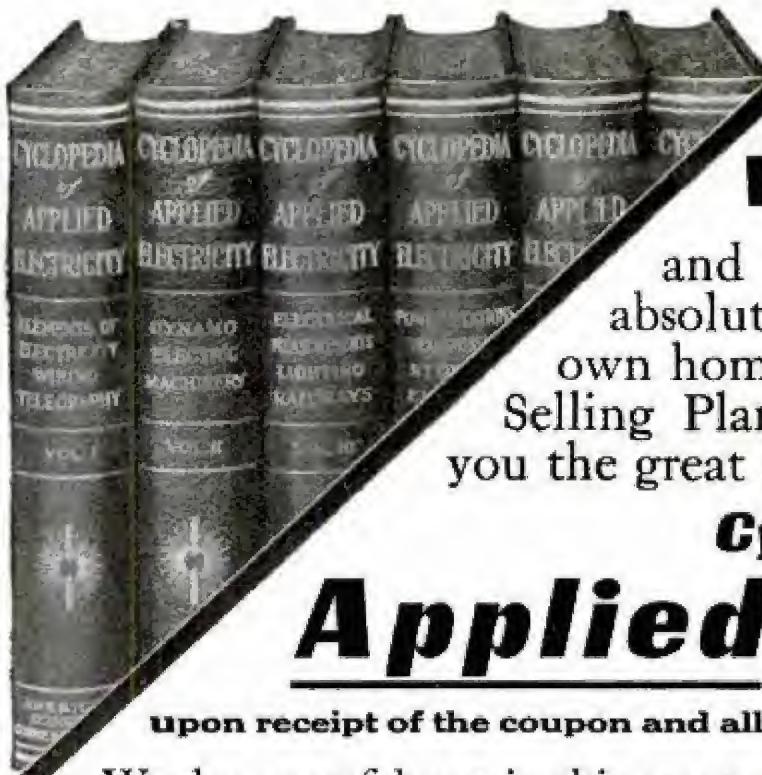


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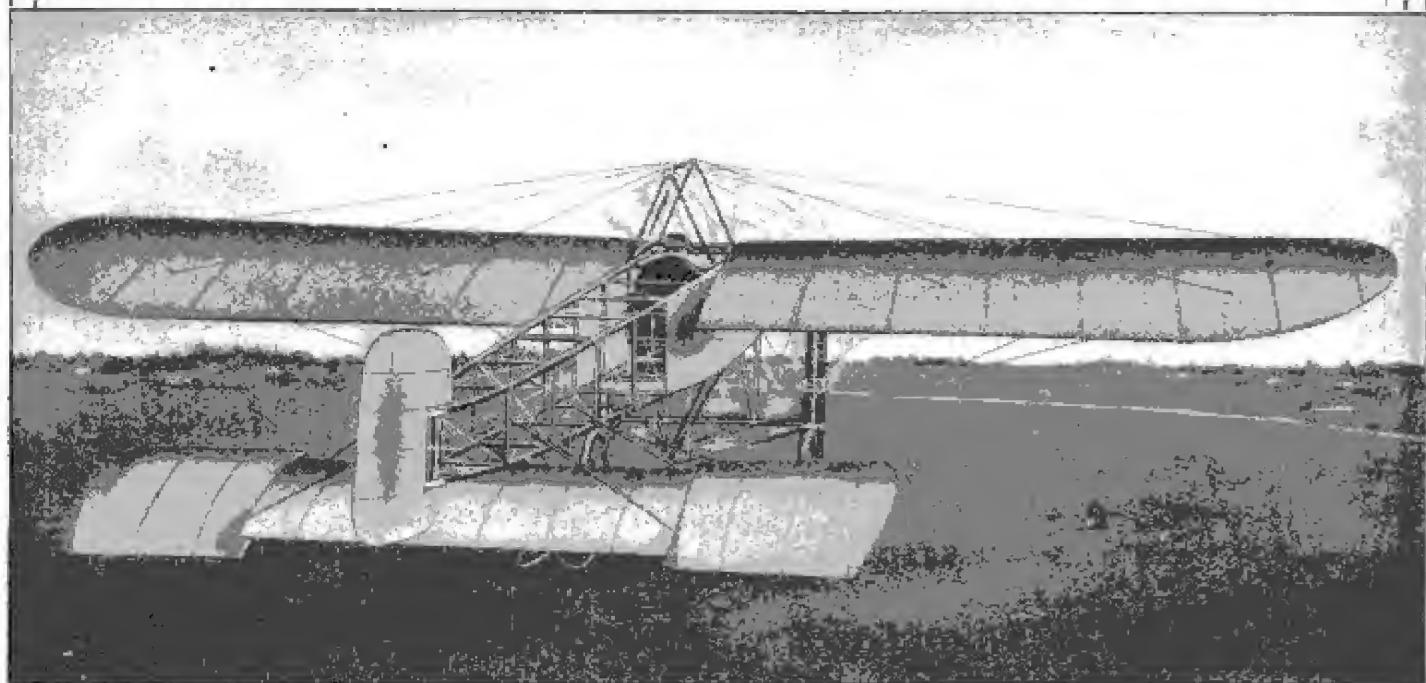
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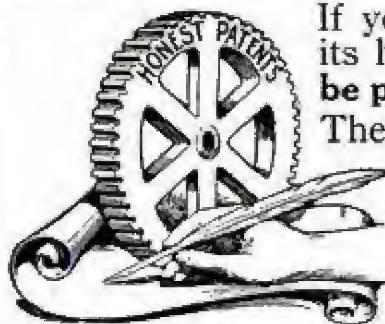
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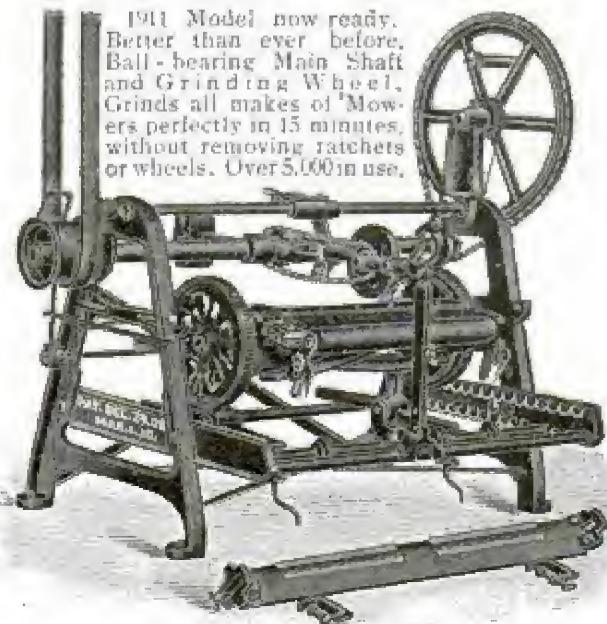
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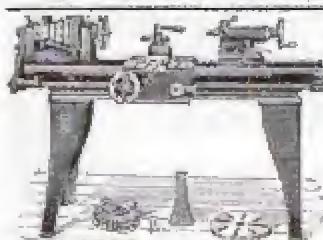
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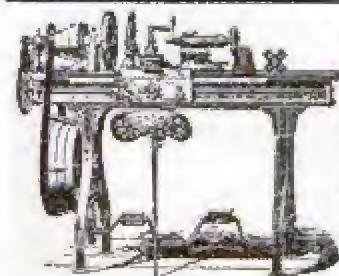
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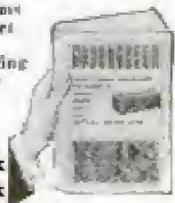
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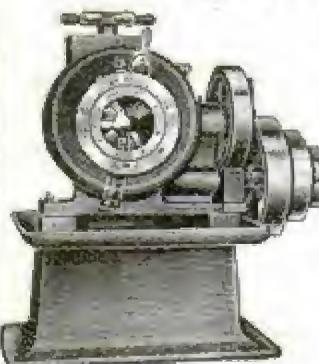
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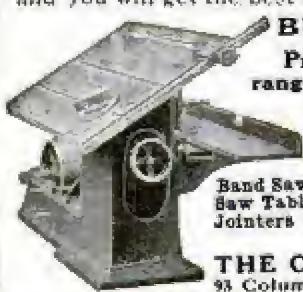
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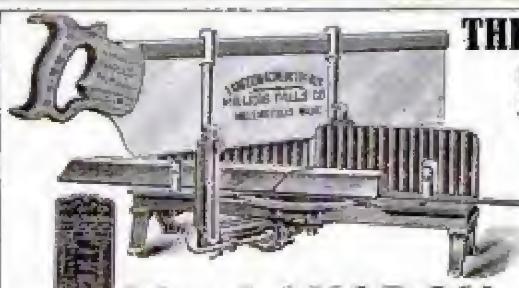


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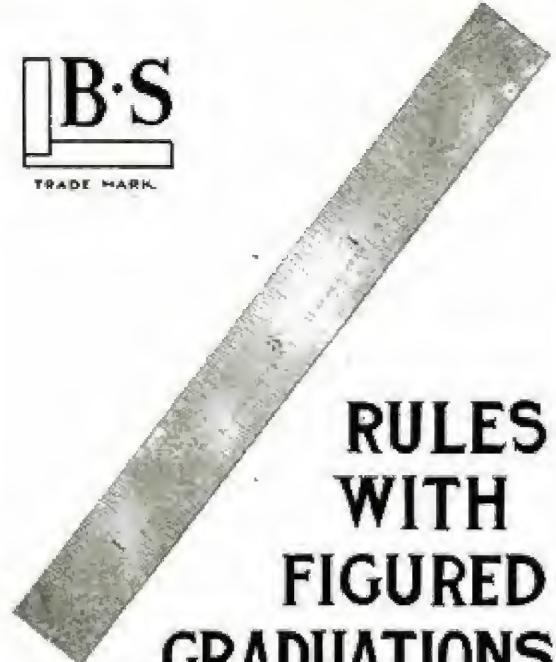
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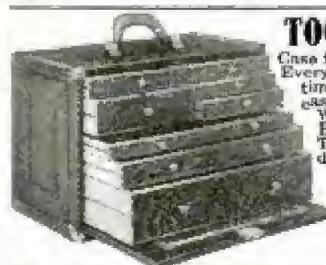
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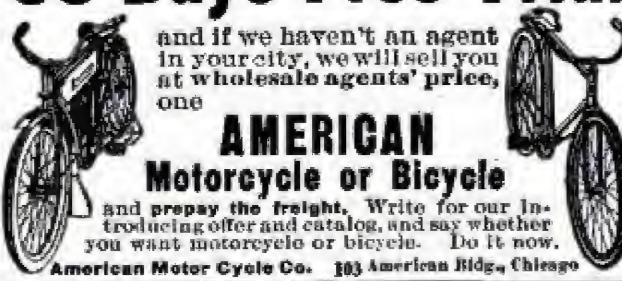
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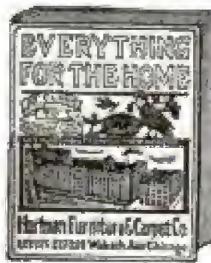
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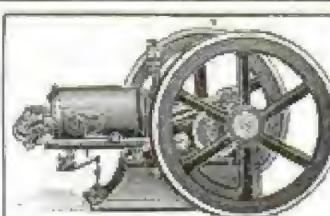
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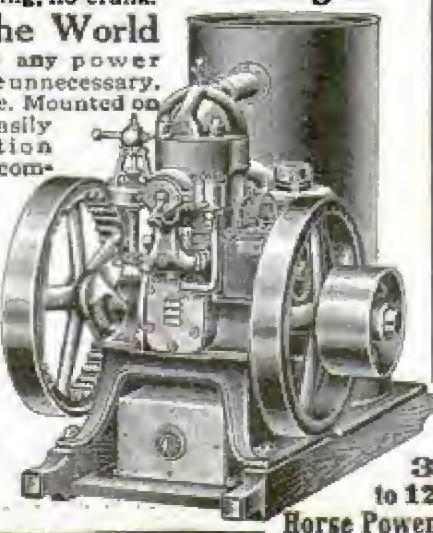
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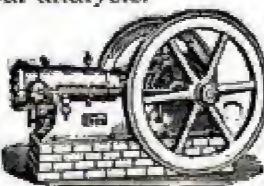
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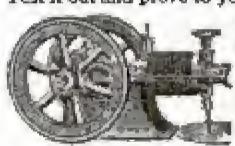
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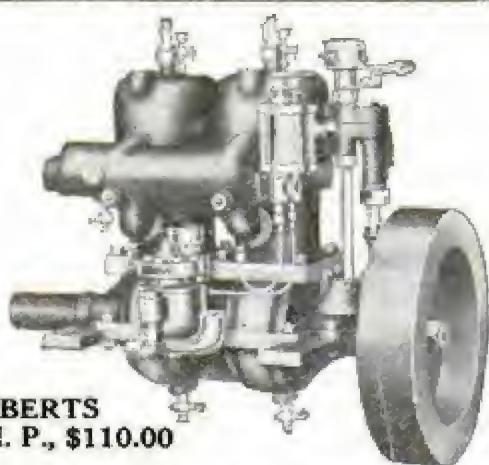
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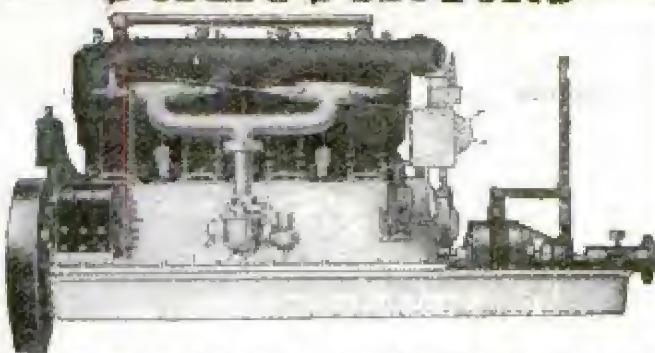
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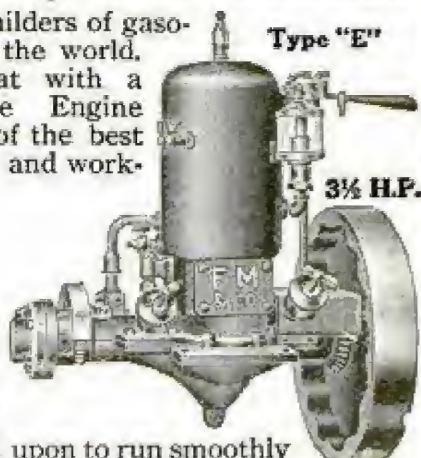
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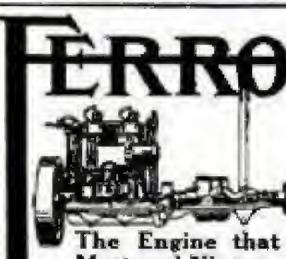
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[106]



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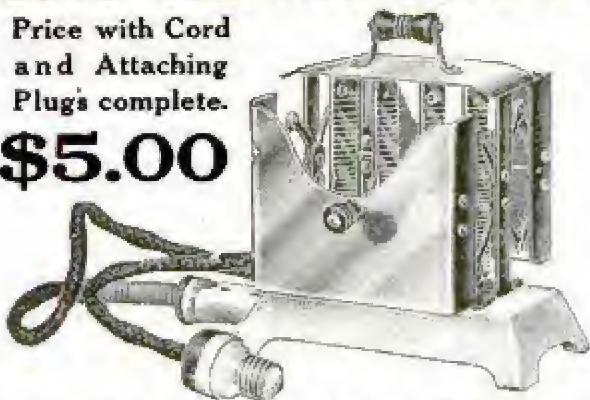
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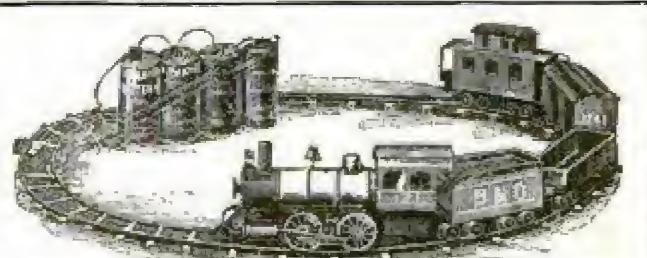


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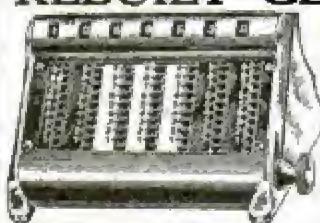
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the process and makes flowers revert to the original leaf type.

It is interesting to note that this theory of adaptation was not first formulated by a botanist, but by the great poet Goethe, who expressed it in a literary work published in 1790.



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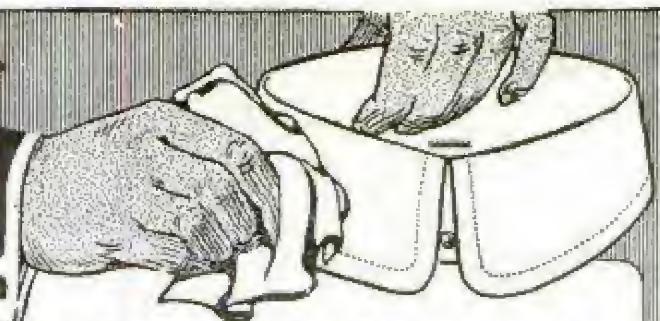
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See page 119

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warranted never to harden, shrink, shrivel, crack or peel, no matter how often soaked, dried or cleaned.

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New—Powerful—Irresistible Think of it! gives every home a modern bathroom for only \$6.50—abolishes tubs, bowls, buckets, wash rags, sponges. Supplies hot or cold water in any room. No plumbing—no water works—self heating—makes bathing 5-minute operation—easily carried from room to room—child operates easily. Means no more cold rooms, drudgery, lugging water, filling tubs, emptying, cleaning, putting away. No wonder agents without previous experience make small fortunes, buy homes, have an automobile, bank account; average 8 orders to every 10 families. Fascinating, dignified, exciting work. No competition—patent new—field unworked—demand enormous—price insignificant—a demonstrated gigantic success—everything ideal for making money. Don't hesitate—business supplies capital. Be first. Get exclusive rights. Spare time gave Oviatt, Iowa, minister, \$800 in 11 days, \$4,000 to date. Reads like fiction, yet we prove all by affidavits, addresses, any proof you want. Address postal today for full details.

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naval authorities to give it consideration. But now an even more remarkable oversight is reported. A midshipman, after the usual course and graduation at Annapolis, was assigned to duty on a battleship last July. Since then his sufferings from seasickness have been so frequent and acute that he has asked to be allowed to resign from the navy. Nor is his an isolated case. Nearly a dozen midshipmen and younger ensigns, it is said, have left the navy within the year because of seasickness.

When it is considered that the government has been

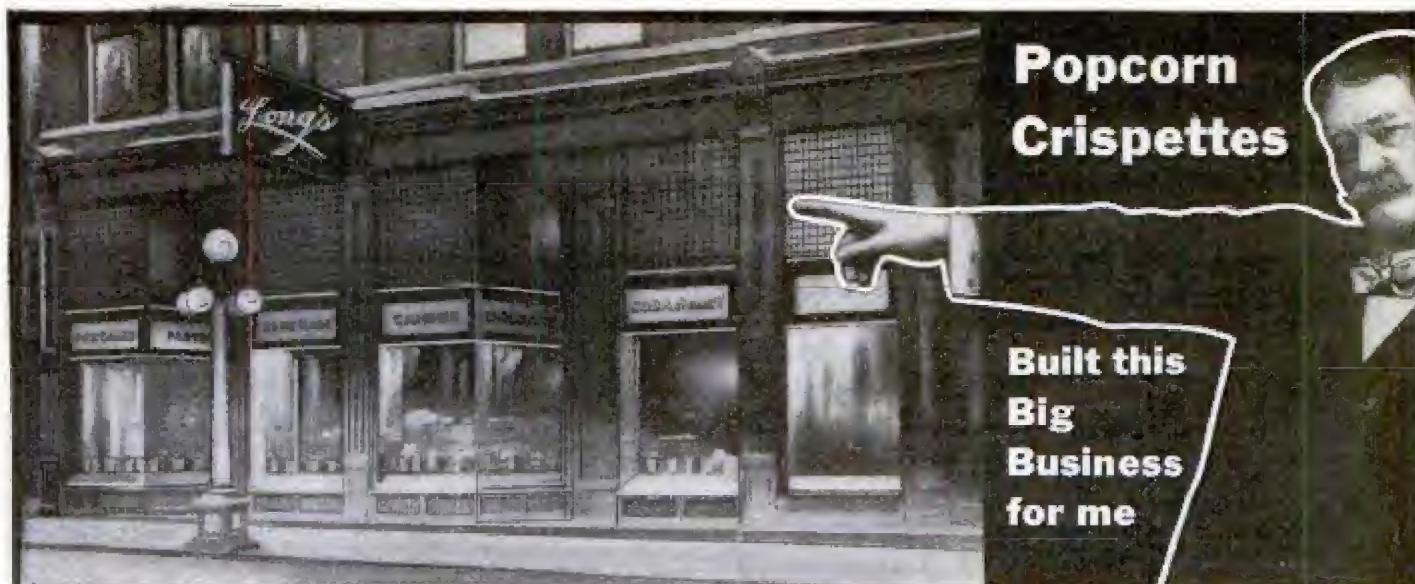
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See page 119

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What are you going to do during the winter months? Just barely earn a living—keep wishing for something better to turn up. Don't do it.

Listen! Take that money you've laid up against the day of opportunity, invest it in a Long Popcorn Crispette Machine and build up a big business the same as I. If I did, you can—that's sure.

You see on this page a picture of my big handsome crimp-

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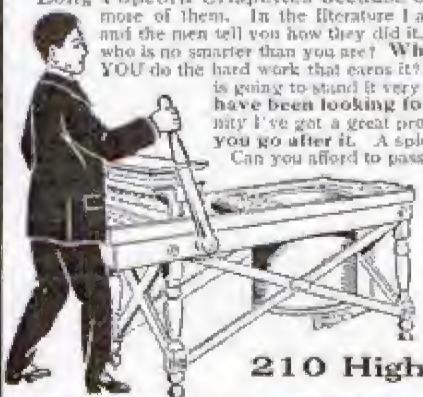
Somewhere in your town there is a small vacant store—a part of a building—a window—a little nook where the rent isn't high. There you can set up your machine, and make and sell Crispettes.

Every time you take in a nickel you make three cents profit

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is going to stand it very long. Neither are you. You've got your future to think about. You have been looking for a good chance and here it is. To the right man in each community I've got a great proposition to make. Are you one of them? Success is yours if you go after it. A splendid opportunity faces you. It may never come your way again.

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to the expense of educating these young men for a service that they cannot fulfill, and that the victims have spent years qualifying for a career they have been forced by physical disability to abandon, it inspires the natural inquiry why, as in the case of sailors who cannot swim, some test is not made to determine their ability to cope with Father Neptune before all this effort, time and expense is wasted? But perhaps this suggestion, remarks the Pittsburg Dispatch, like that of teaching sailors to swim, was so simple as to be overlooked.

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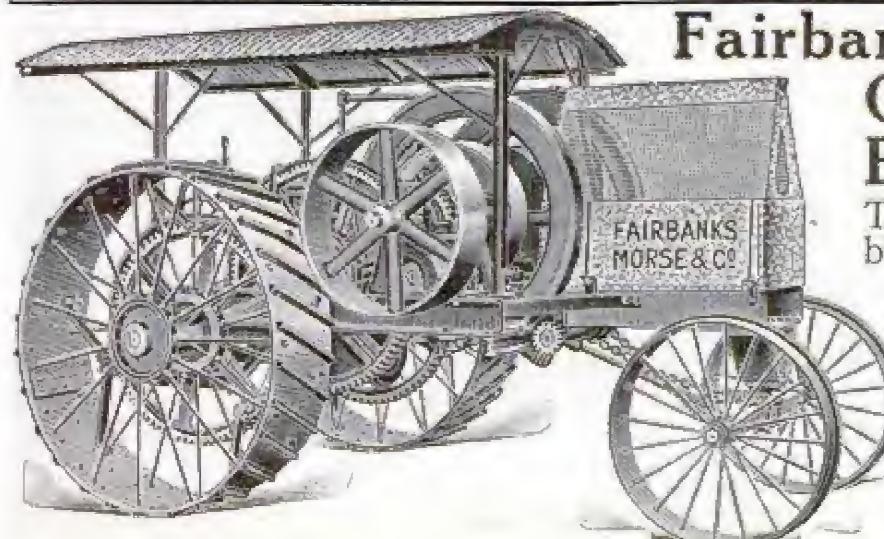
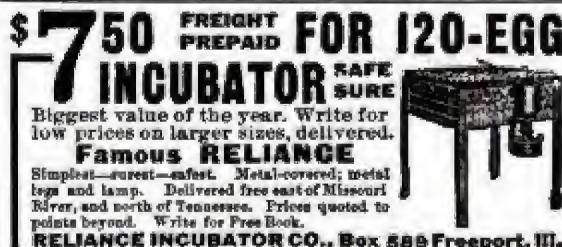
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clusion was dispelled by the observation of two naturalists.

A black snake, measuring perhaps a trifle over 6 ft. was found clinging to the side of a small tree, around which it could have wrapped itself nearly twice had it wished to do so. Instead of this the snake passed right and left at short distances, catching the folds along its under parts over and behind slightly projecting rough strips of bark.

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ground, one of the naturalists grasped its tail to test its climbing qualities, but so great was the force with which it pulled upward that it proved a difficult task to hold it. Finally, becoming annoyed at this ill treatment, the snake reached down threateningly at the offending hand and losing its hold, fell to the ground.—Harper's Weekly.

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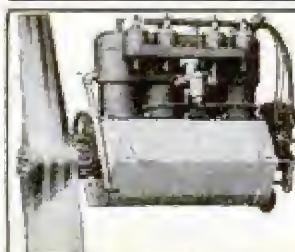
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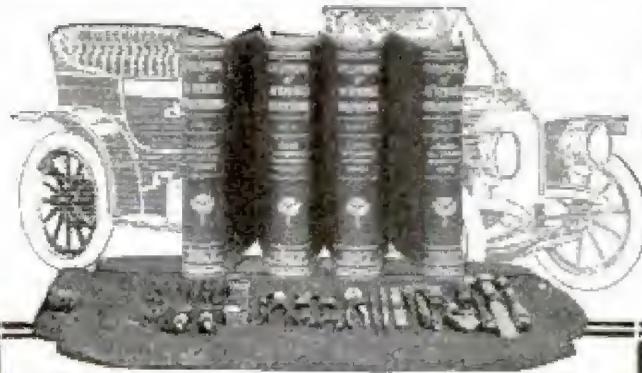
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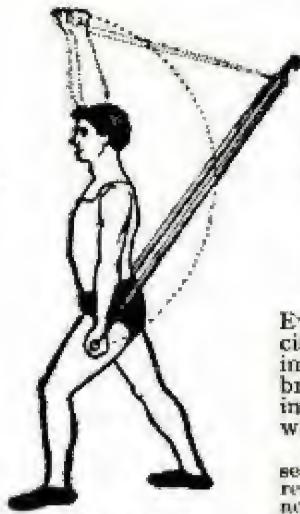
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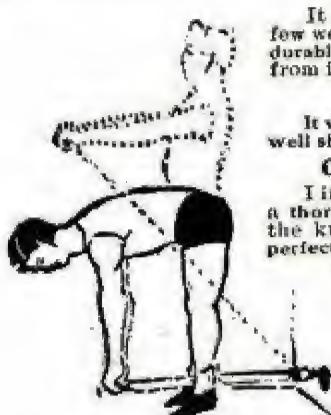
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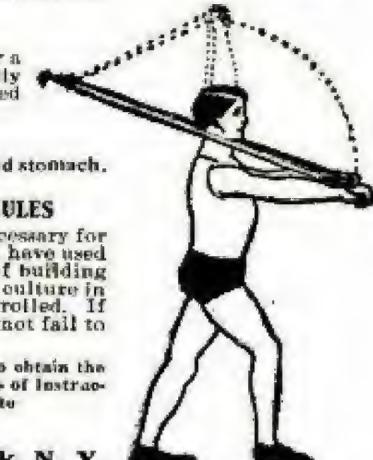
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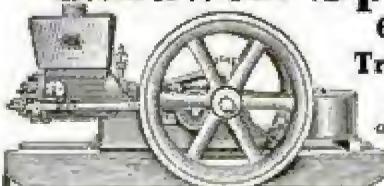
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See page 119

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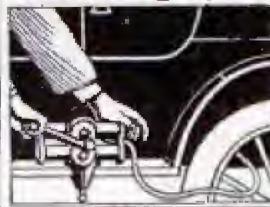
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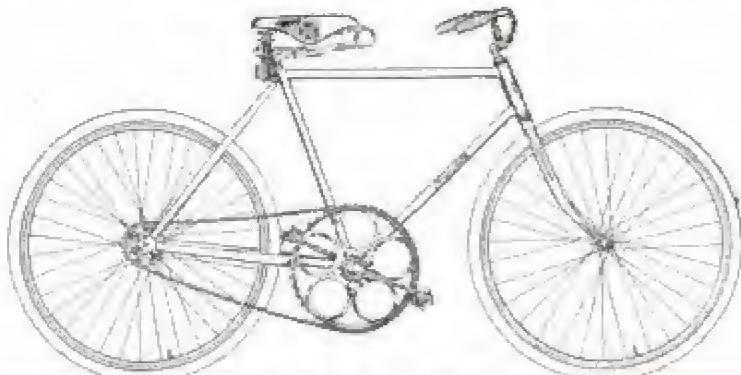
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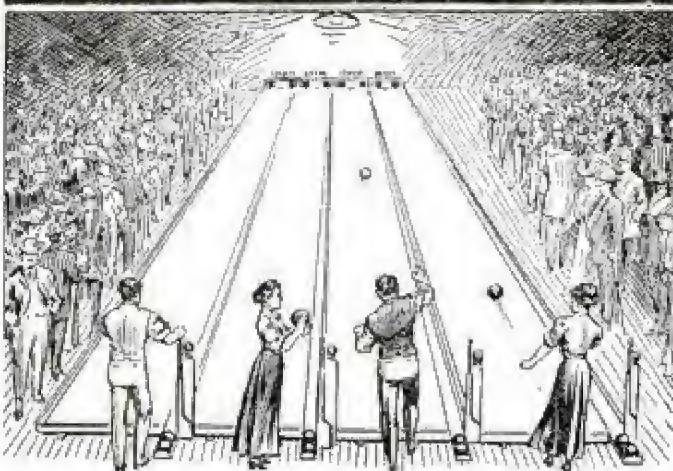
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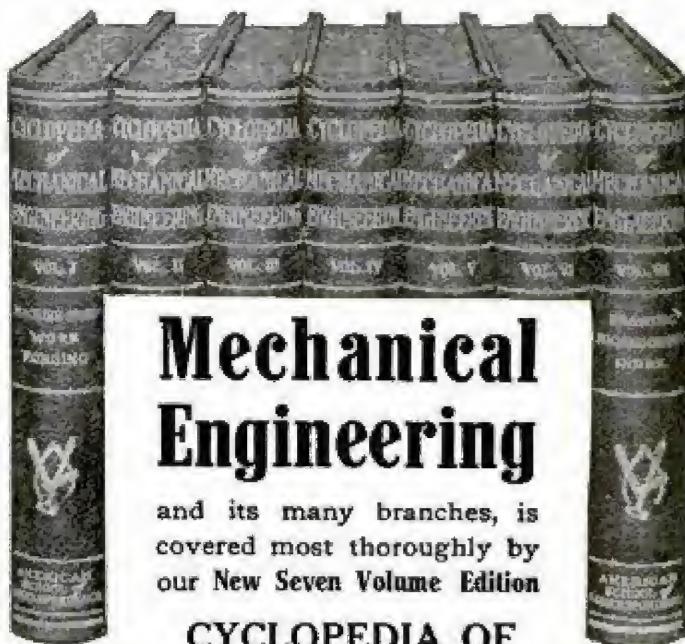
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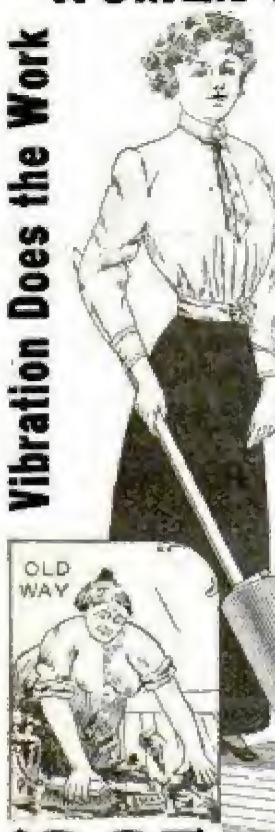
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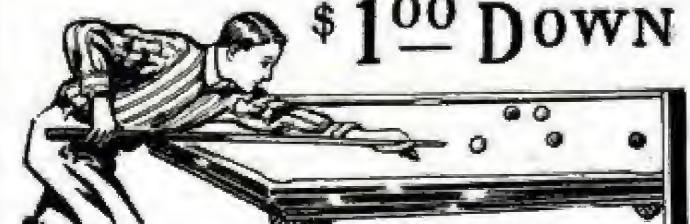
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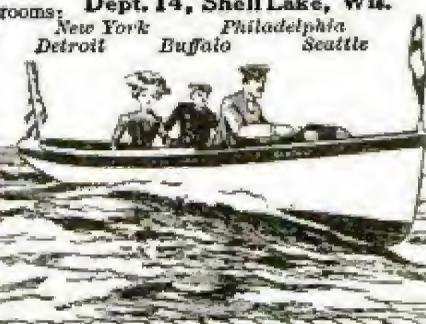
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Shell Lake Boat Company

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with contempt upon the pockethook as indicative of a "tight" disposition.

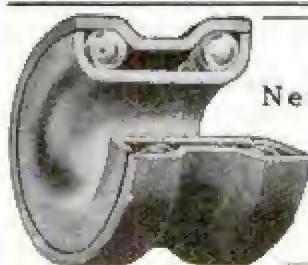
The Frenchman makes use of a leather purse with no distinguishing characteristics. The German uses one gayly embroidered in silks by the fair hand of some Lottehen.

The half-civilized capitalist from some torrid South American city carries his dollars in a belt with cun-

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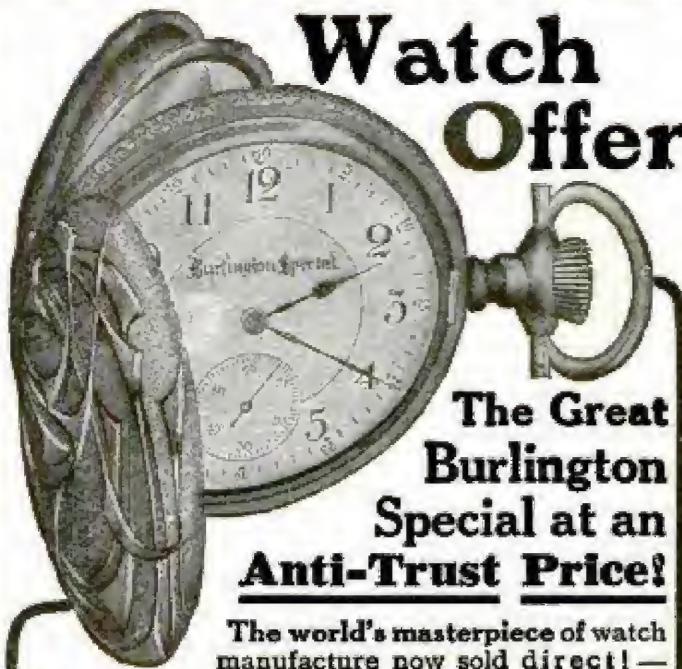


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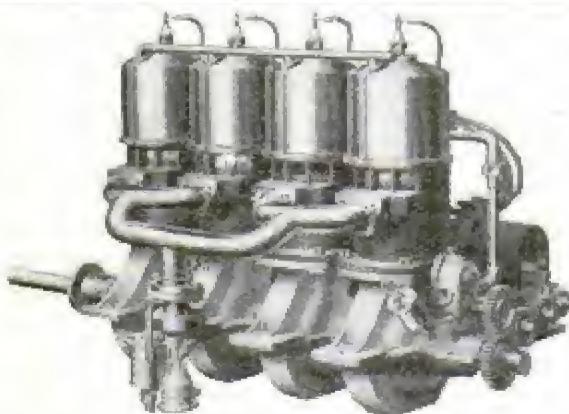
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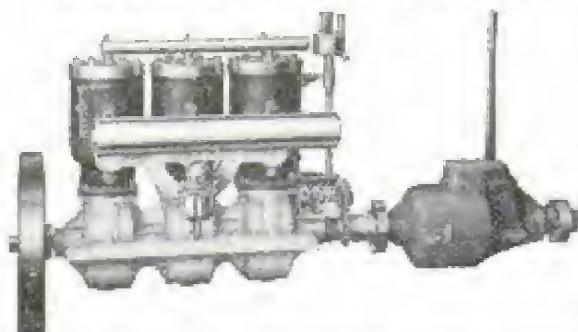
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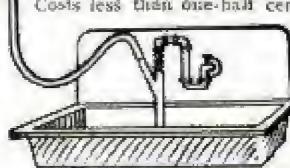
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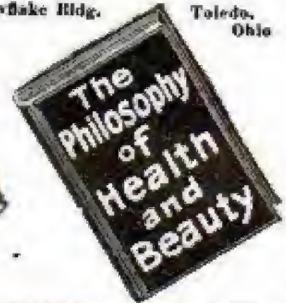
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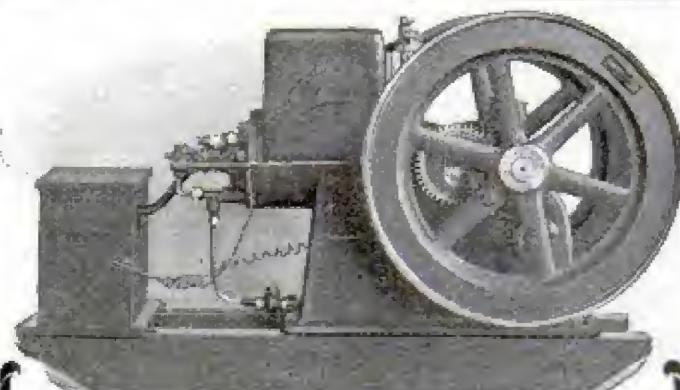
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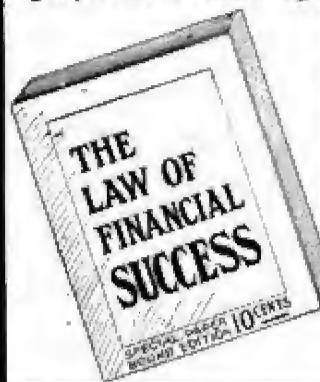
"THE LAW OF FINANCIAL SUCCESS"

Q It is as full of good things as an egg is full of nutriment. It is the essence of money-making boiled down for busy people.

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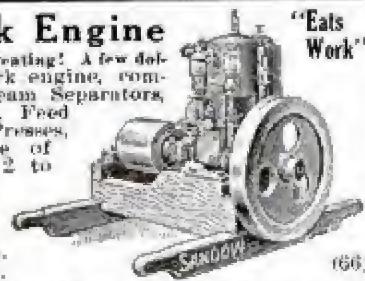
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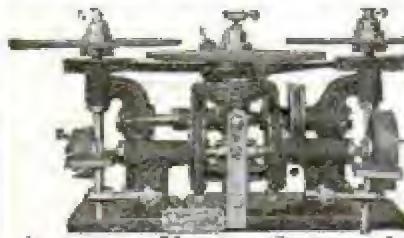
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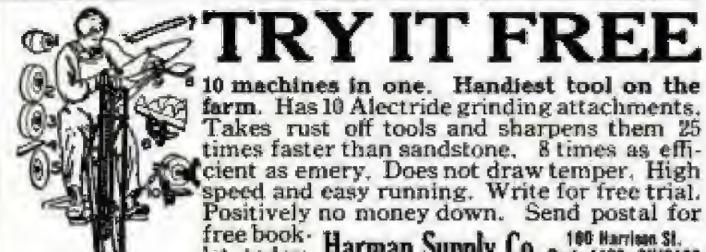
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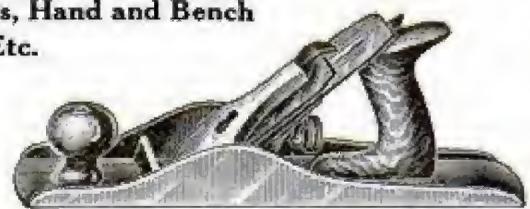


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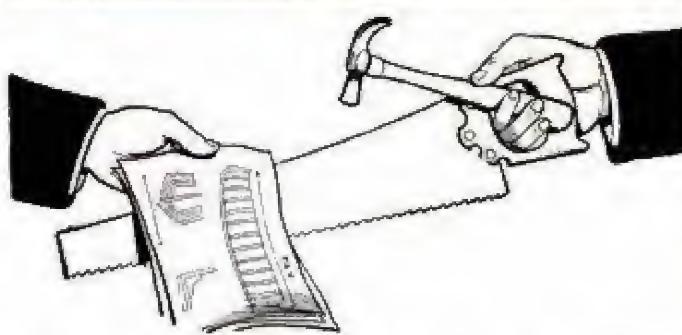
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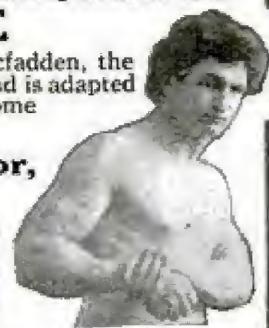
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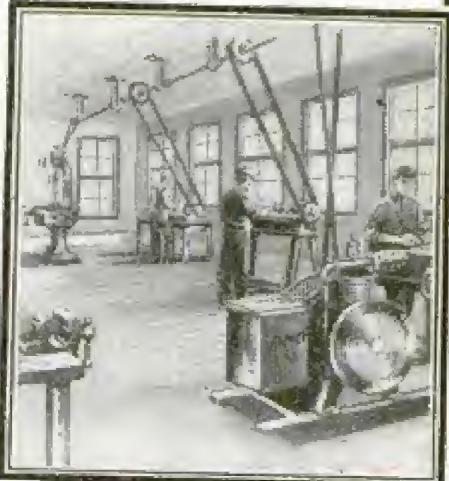
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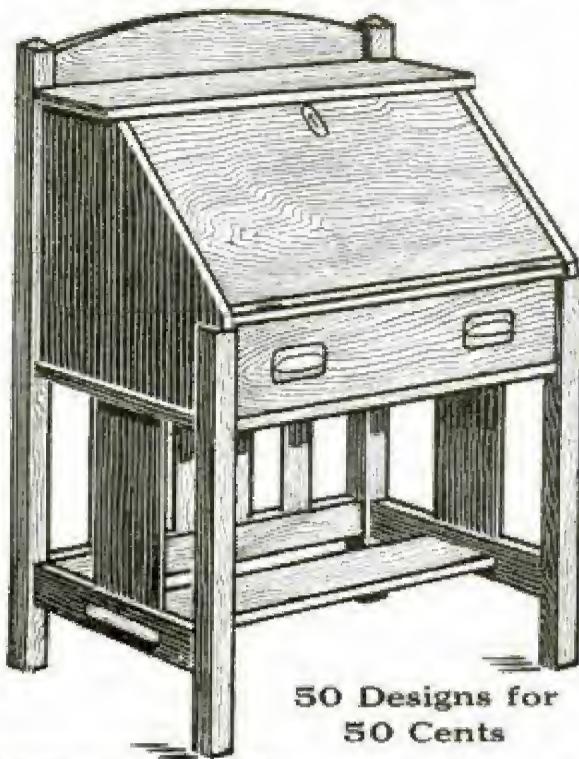
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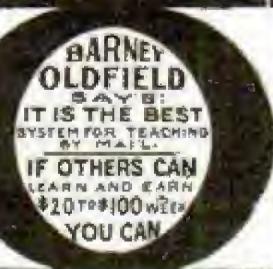
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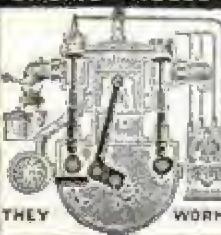
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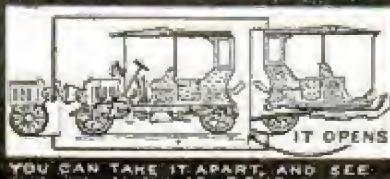


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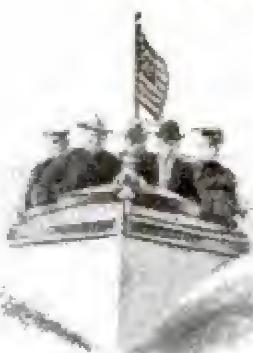
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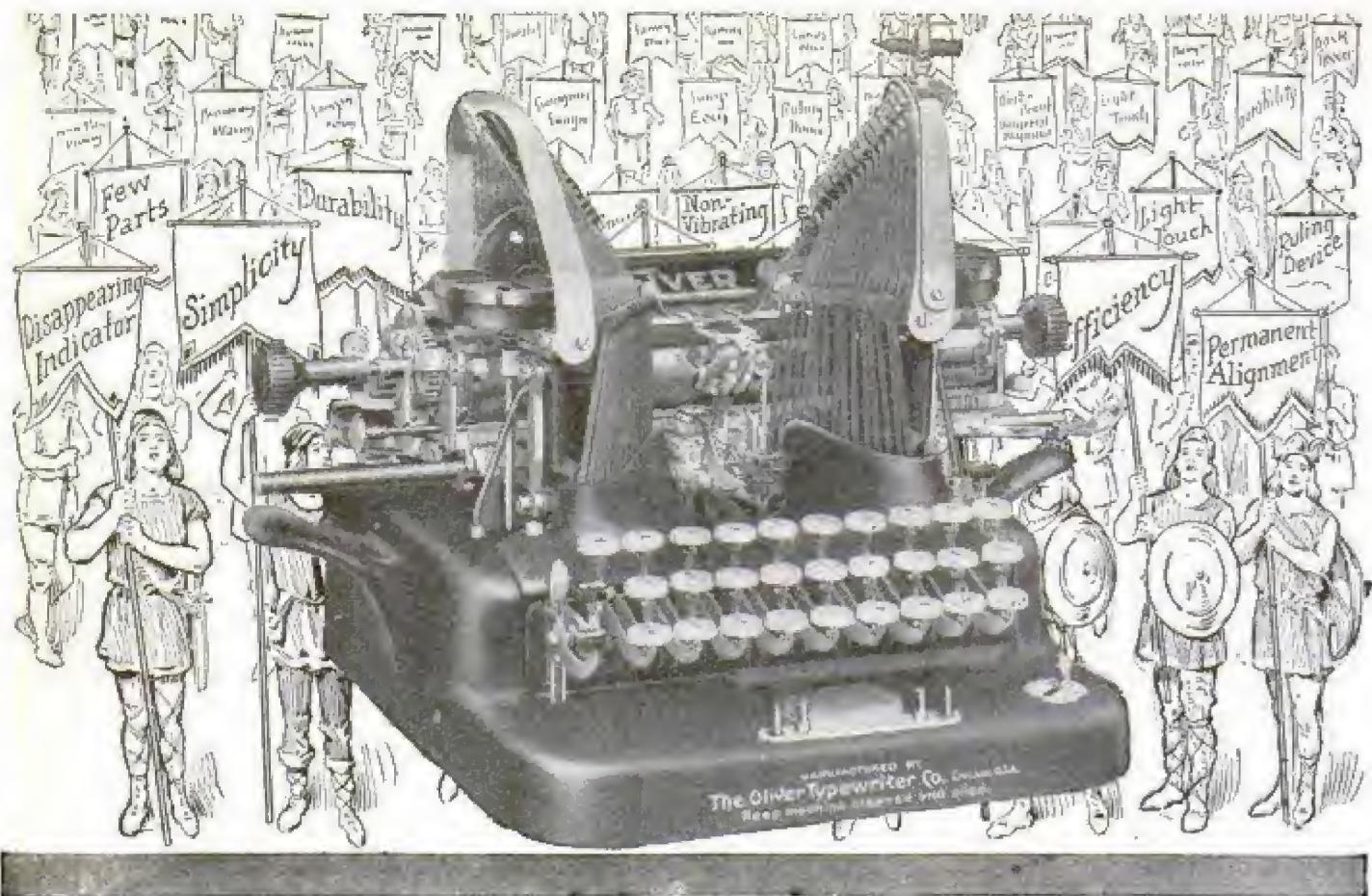
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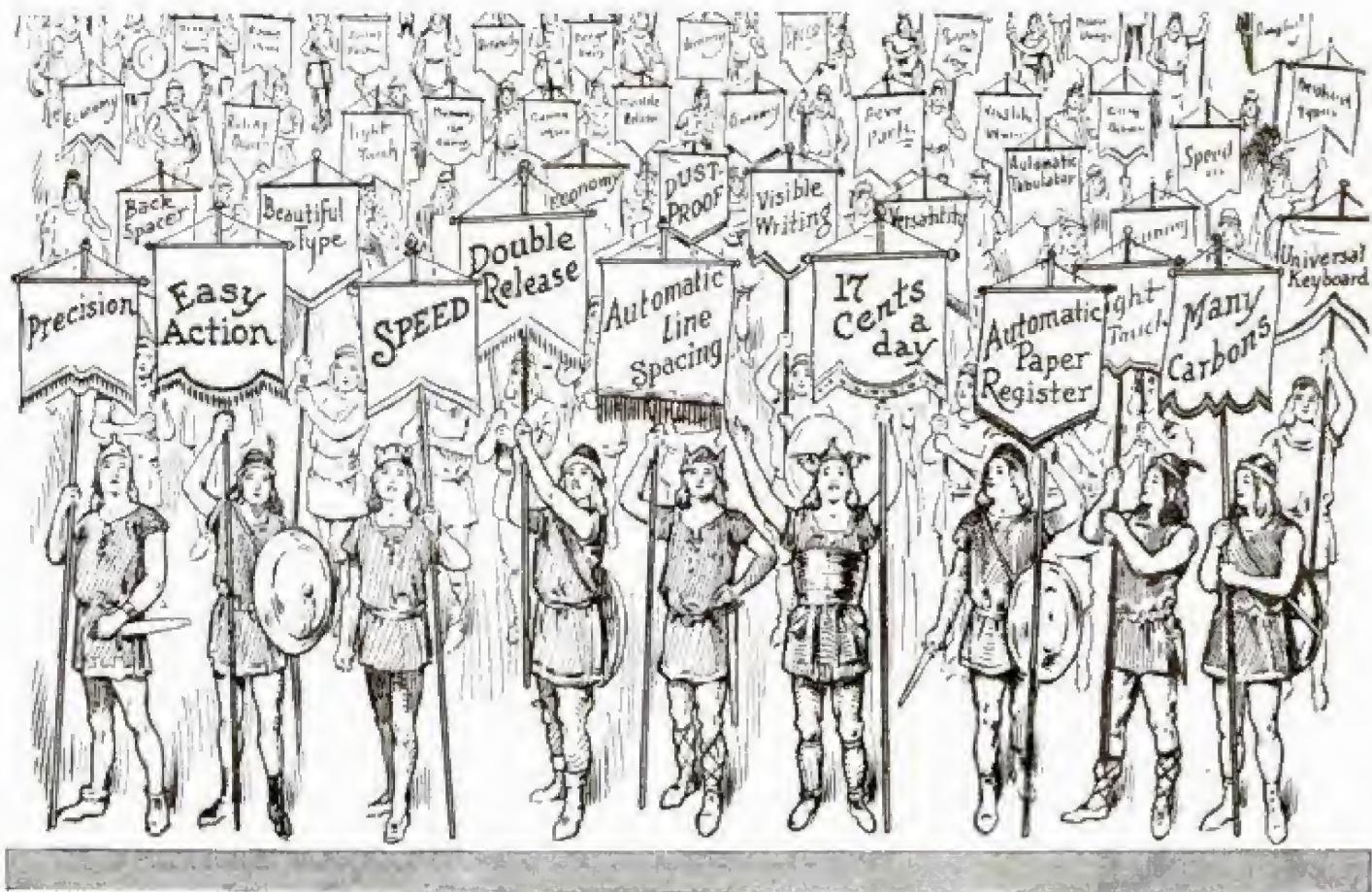
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for all woodwork, floors and furniture (including pianos). Anyone can easily use Johnson's Prepared Wax over any finish or on the bare wood for that beautiful, artistic, dull finish so much in vogue. Ask your dealer for sample.



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a thin, elastic spirit finish far superior to varnish or shellac. Not thick or sticky or slow-drying like varnish—neither does it dry too quickly like shellac. Especially good on linoleums and oilcloth, bringing out the pattern and giving a finish as glossy as new. Protects from wear—makes cleaning easy. Dries hard in an hour. Gallons \$2.50—quarts 70c—pints 40c.



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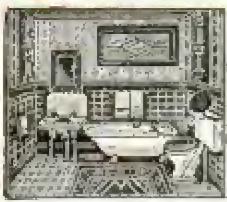
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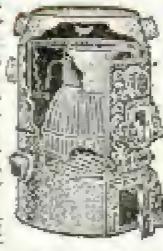


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